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The Influenza Epidemic
in England and Wales
1957-1958



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PREFACE

The report which follows is a distillate of a large volume of information assembled by the Department concerning the epidemic of influenza which occurred in England and Wales between June, 1957 and April, 1958. It was part of the world-wide pandemic which is thought to have originated in China where the causal virus was first identified in February, 1957. From China it reached Hong Kong in the second half of April, Singapore in May, and thereafter spread rapidly.

An interesting feature of the pandemic was the way in which its course could be charted, thanks to the pre-existing arrangements made by the World Health Organization for the study of influenza throughout the world. Another was the rapidity with which it appeared to spread in the tropical regions of Asia and Africa and its relative slowness in Northern Europe and the British Isles.

Information collected from many countries was published by the World Health Organization in 1959. The present Report is concerned essentially with events in England and Wales and does not attempt to consider in detail the international aspects of the subject or the part played by the World Influenza Centre, London, in technical investigations and advice.

It is fortunate that the clinical manifestations in this pandemic were generally milder than those of the pandemic of 1918-19 which was responsible for an excess mortality of 200,000, of which 150,000 deaths were ascribed to influenza. Nevertheless, it is thought that in 1957 alone the recent epidemic was responsible in England and Wales for some 30,000 deaths of which 6,716 were ascribed to influenza itself.

The brunt of the outbreak seemed to fall primarily on schoolchildren and young adults in whom recovery was usually rapid.

The effect of antibiotics in the treatment of uncomplicated attacks of influenza was negligible. There was no evidence that their use was of the slightest value in preventing complications from developing.

A hopeful feature of the report is the prospect given of control by the beneficial effects of vaccination with an appropriate vaccine. The importance of this for the maintenance of essential services, education and industrial output does not need to be emphasised.

The original material was assembled by Dr. C. Grant Nicol of this Department, who also made the first draft of the report. Thereafter, a small departmental Editorial Committee gave it its final form.

JOHN A. CHARLES.

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I

INTRODUCTORY

The outbreak of Asian influenza which first reached this country in June, 1957 was widespread but for the most part mild for an influenza epidemic. It has been considered worthy of special report mainly because the causal strain of the influenza virus was an entirely new variant of the A strain and also because world-wide arrangements for laboratory investigation and exchange of intelligence made possible for the first time a well-informed and accurate observation of the spread of pandemic influenza, together with a reasoned forecast of the paths of spread.

It may be of interest to review briefly the several stages by which knowledge of influenza has been advanced through study of earlier world-wide outbreaks.

The pandemics of 1889-90

The winter of 1889-90 saw the return of influenza in epidemic form to this country after an absence of 43 years. This was the first epidemic of influenza of any considerable magnitude in the British Isles since the establishment of a central health authority, and a most comprehensive inquiry was undertaken by the medical staff of the Local Government Board. A Report, prepared by Dr. H. F. Parsons, described in some detail the epidemiology and clinical manifestations of the disease, both in the British Isles and throughout the world. In great measure Dr. Parsons' report was a detailed recording of demonstrable paths of spread of the infection, with the purpose of showing that the pandemic had advanced at a rate and in a manner entirely consistent with its dissemination by human agency. He thus refuted the widely held and firmly entrenched beliefs that influenza was derived from emanations from the soil (*miasmata*) and was subsequently spread to great distances by prevailing winds to infect simultaneously a whole district, county or province. Equally current and equally firmly refuted was the view that influenza in man was preceded by and derived from an epidemic disease of horses termed "horse influenza".

In his foreword to Parsons' Report, Sir George Buchanan, then Medical Officer to the Board, commented that "the matter which most exercised the public mind was the source of influenza. The universal desire in every country appears to have been to accuse another country of generating the epidemic, accusing by preference the more distant ones". Of these, Russia and China were generally held to have originated the epidemic. In point of fact the pandemic of 1889-90 first appeared in three widely separated parts of the world at the same time. In May, 1889, influenza of a severe type was prevalent in Greenland, as well as being reported in Athabasca in north-west Canada; at the same time the disease appeared in Bokhara, Central Asia. Subsequently influenza spread over the whole of the known world, the epidemic appearing in this country towards the end of 1889, but the main incidence being in the opening months of 1890.

Having offered all reasonable proof that the pandemic had spread westward to Europe from Bokhara by human agency along the regular and ordinary paths of travel, Dr. Parsons, like numerous other careful observers, expressed the firm belief that influenza was caused by a specific germ, that it was a highly communicable disease with a short incubation period, that susceptibility was general and immunity after attack doubtful, and that the many slight or unrecognised cases contributed materially to the spread of the disease.

Influenza appeared again in this country later in 1890 and was prevalent in epidemic form in the spring of 1891, to be followed in the winter of 1891-92 by a third epidemic. These later outbreaks in this and other countries were the subject of a further but shorter report by Dr. Parsons and the occasion of systematic bacteriological studies by Dr. Klein, F.R.S., to determine if possible the causal germ of influenza. These investigations led Klein to agree with the conclusions of Pfeiffer and Kitasato* that the organism first described by them and now known as *Haemophilus influenzae* was the causative bacillus.

1892-1918

Influenza has remained with us as a frequent cause of winter concern since the pandemic of 1889-90. In 1895, 1900, 1908 and 1915 there occurred outbreaks of considerable magnitude, but that of 1918-19 far surpassed anything previously recorded.

The pandemic of 1918-19

Not since the plague of Justinian's reign and the Black Death of the 14th century had there been so great a scourge. Within a few months the pandemic destroyed more human lives than did the European war in five years, carrying off upwards of 200,000 persons in England and Wales alone of whom 150,000 were certified as having died of influenza. Everywhere the disease bore hardest on healthy young adults, tending to spare those at the extremes of life. The official record of this outbreak given in the Report on the Pandemic of Influenza 1918-19, written by the medical staff of the newly formed Ministry of Health in collaboration with others distinguished in their own special fields, supplemented that† published in 1920 by the General Register Office.

Once again it was apparent that no country was prepared to accept responsibility as the place of origin of the pandemic, and as in former years each sought to lay the blame elsewhere.

The writers of the Ministry's record were at particular pains to show that the pandemics of 1918-19 and of 1889-90 had been preceded by localised outbreaks of influenza in this country as also by outbreaks of infectious diseases of the central nervous system, and that disturbances of the public health had been recorded as preceding all known epidemics of influenza. By reasoned argument, which need not be re-stated here, it was contended "that we might have explosions of influenza even if Russia or Spain did not exist and the British frontiers were hermetically sealed."

Possible viral cause of influenza

Equally with its source, the cause and possible prevention of epidemic influenza was the occasion of both speculation and scientific inquiry. In the

* *Deutsche Med. Woch.* 1892, 2.

† Report on the Mortality from Influenza in England and Wales during the epidemic of 1918-19. 1920, London. His Majesty's Stationery Office.

Ministry's report of the events of 1918-19 Sir Frederick Andrewes provided an appreciation of what was then known of the microbiology of influenza, and examined the claims of Pfeiffer's bacillus and the evidence in favour of a viral cause. He concluded that the position of *Haem. influenzae* as the primary cause of the disease "had been in no way strengthened" despite its established place as a cause of secondary infections of an abnormal fatality, while "the evidence for a filter passing virus as the primary cause of the disease is suggestive but at present a final verdict cannot be given." In the absence of precise knowledge of the cause of influenza, no true advance could be made to provide a specific vaccine, and as would be expected, equivocal reports were received of the efficacy of the anti-influenzal vaccines then available, which were derived from *Haem. influenzae* and pneumococci.

Experimental evidence of a viral cause of influenza

Of the prospect for the future, the authors of the Ministry's Report wrote "the problem of influenza is still unsolved, its solution will be one of the great events in the history of medicine". In the 40 years that have elapsed since the events of 1918-19 we have come some part of the way at least towards this solution.

In 1933 Smith, C. H. Andrewes and Laidlaw experimentally transmitted influenza from human sources to ferrets by nasal instillation of bacteria-free filtered throat washings derived from patients in the early stages of influenza. They showed that the disease could be passed serially in ferrets, that recovery of the experimental animal was followed by immunity and that both serum from convalescent ferrets and convalescent human beings neutralised the ferret virus.

With one strain of the causative agent of the disease now available for laboratory study, identification of further members in the group of influenza viruses followed and recognition of the serological reactions to which the several strains give rise in infected persons placed diagnosis on a firm aetiological basis.

In 1935 the influenza virus was successfully cultivated in the fertile hen's egg by Wilson Smith. Further developments and application of egg cultivation were subsequently made both in Australia and the United States of America. The discovery that the virus could be grown in this way meant that investigation of its properties could be conducted on a very much greater scale than was possible when ferrets were the only means of laboratory propagation. It also meant that different viruses and strains of virus could be identified with reasonable ease and accuracy. Moreover, it enabled the establishment throughout the world of influenza reference laboratories linked to the World Influenza Centre in London and to other major study centres where detailed laboratory investigations can be undertaken and arrangements made for the collection and exchange of epidemiological information.

The whole subject of influenza has long been beset with difficulties in making clear-cut distinction between true influenza and the many other influenza-like illnesses. Since these occur in one form or another in England and Wales every winter, it is understandable that in reports of earlier influenza pandemics antecedent localised outbreaks of illness clinically indistinguishable from that subsequently seen in epidemic form were often mentioned. While certain of

the older observers were convinced of the unity of a pandemic influenza and its trans-continental spread, others maintained that the seeds of a world-wide outbreak were already present in every country, and that they needed only breakdown of sanitary conditions to become epidemic.

While at this distance of time it is not possible to re-examine the validity of the reasons which so frequently led former observers to doubt the unity of epidemic influenza, there is clear evidence of the homogeneity of the 1957-58 influenza pandemic and, in areas where there was opportunity for investigation, equally definite proof that certain antecedent local outbreaks were not of influenzal causation (Holland and McDonald).

II

INVASION AND SPREAD

The arrangements operative for the study of influenza at international level provided exact data about the 1957 pandemic from the outset. The virus was first identified by Drs. F. F. Tang and C. M. Chu in China in February though the first official reports to give warning of its spread came later from Hong Kong and Singapore. A widespread outbreak developed in Hong Kong during the second half of April, 1957 and reached Singapore in May. Laboratory investigations showed that these outbreaks were associated with a new antigenic form of influenza virus A, which later became known as Virus A 2. Strains of this variant isolated in Hong Kong, in Singapore and Malaya and in Japan were found to be closely related to each other but widely different from any previously isolated virus A strain. Human serological studies in several parts of the world led to the complementary conclusion that antibodies to the new variant were absent from most members of the population prior to exposure to the virus.

Predicted spread

The establishment of these facts at a time when outbreaks of influenza were still confined to a few Asian countries was of cardinal importance in forecasting the subsequent trend of events. The likelihood that the new virus would spread in a presumably susceptible world population and so give rise to extensive epidemics was predicted even at that stage. Many countries were thus enabled to plan measures for combating influenza well in advance of the appearance of the first cases. What could not be estimated so certainly was the precise rate at which the infection would travel, this being dependent on many random elements and also, possibly, on actiological factors which were still not understood.

Peoples of the temperate zones have become accustomed to regard influenza as a disease essentially of the winter months. This seasonal incidence was observed, for instance, in England and Wales whenever influenza was epidemic throughout the years since 1918, but in 1957 spread occurred without apparent relation to climate or season and the disease affected north-western Europe during late summer and early autumn.

Introduction of the virus into this country

The first cases of influenza of Asian origin to be recognised in this country were among persons recently arrived from the Far East by air. The earliest isolations of the Asian virus were in specimens, taken in London on 17th June, 1957, from Pakistani naval ratings. At this date influenza had extended westward on a large scale as far as India and Pakistan. Travellers by air who had acquired the infection in these regions developed symptoms either during the journey or within 48 hours of arrival.

So long as the pandemic was limited to the Far East the likelihood of introduction of infection by sea-borne traffic remained small. Outbreaks among passengers and crews of inward-bound liners were reported during the first half of June but these had subsided by the time the vessels reached European ports. As the epidemic in Asia continued to spread westward, the length of the sea voyage to Europe from the nearest affected regions progressively diminished. In consequence there was an increased likelihood that ships in which influenza was occurring would reach this country before the outbreak aboard had come to an end and that persons would disembark while still in an infectious state. The earliest recorded instance of this mode of introduction followed the arrival of a liner at Southampton on 26th June, 1957.

Individual cases and groups of cases continued to arrive by sea and air throughout July. During the early part of August extensive outbreaks began to develop in certain parts of Europe and the sources of infection reaching the British Isles were then augmented by travellers from the Continent.

Localised outbreaks

The period mid-June to mid-August was characterised in this country by the development of numerous localised outbreaks of influenza. The first of these to attract attention followed the arrival by air on 13th June of a party of Pakistani naval ratings who were accommodated aboard a vessel lying at Tilbury dock in the Port of London. On 10th June one of the party had developed an acute respiratory illness, and on 12th June eleven more were taken ill. Influenza virus A 2 was isolated from three of these patients. While at Tilbury some members of the party were in contact with the crews of two other ships which sailed for Liverpool on 18th June. Almost at once cases of influenza began to occur among the crews of both ships.

At the same time serological evidence of infection was found in specimens taken from a Pakistani welfare officer who had visited these seamen at Tilbury and in three members of his family. Contemporarily with the isolation of virus A 2 from the three Pakistani naval ratings already mentioned the virus was found in a specimen from a patient newly arrived by air from Rangoon.

Sea-borne importation

Sea-borne importation followed close on that by air. Virus was isolated from infectious patients who arrived at Southampton by troopship on 26th June and serological evidence of recent infection was found in upwards of thirty convalescent patients returned from the Far East.

During July and August virus was isolated or serological evidence of infection found in a gradually increasing number of persons from widely separated parts of the eastern world and the southern hemisphere who entered this country by air and by ports at points around the coast. Their places of departure included Aden, New Zealand, South Africa, Lagos, Kuwait, Bahrein, Bombay, Moscow, Finland and Tokyo. Some were passengers on liners, others Lascar or Pakistani crews. Outbreaks occurred among Scouts from all parts of the world coming to this country to attend a jamboree which was to be held in the Birmingham area.

Towns in this country from which newly arrived cases of influenza were reported included Tilbury (mentioned above), Liverpool (both in crews infected

at Tilbury and in those coming directly from overseas), Avonmouth, Sunderland, Jarrow, Winchester (from a naval ship) and Manchester. Influenza was also reported in persons resident in this country dealing with aircraft from abroad—an engineer at Prestwich and in one of the staff servicing Australian aircraft, at Reading.

During the same months cases of influenza were reported from all three Services. The Royal Army Medical Corps detected them in troops returned from the Far East and from the Middle East and in military hospitals in the Chester and Worcester areas; the Royal Air Force in servicemen stationed at Bridgnorth, Louth, Grantham, the Swindon area (infected in Cyprus) and West Kirby, Cheshire; and the Royal Navy in a convalescent patient (mentioned above under Winchester). About the same time outbreaks were reported at United States Air Force stations in Lancashire and Middlesex.

Occurrence in the resident population

Interspersed with continuing reports of influenza in those arriving from abroad and their associates, the first intelligence was received of influenza in the general population. At this time outbreaks were confined to small groups and closed communities such as National Coal Board trainees in the Nottingham area, a professional football team in Sheffield, a docker and his family in Tilbury, a mental deficiency hospital in the Midlands, a girls' school in the Bath area (the first cases being in children arrived from Rotterdam), scouts encamped at Lyme Regis, children in a large holiday camp at Skegness and those at a holiday home in Conway. At this stage, too, every case could be traced with reasonable certainty to its source of infection.

In the week ended 24th August the first reports were received suggesting invasion of the population in general. In Colne Municipal Borough half of the school children were ill, the first cases occurring one week after reassembly. Teachers and parents were also affected. In Nottingham 40 of 70 workers were absent ill from a factory. In the following week the isolation of the Asian variant from a young patient in Colne confirmed the diagnosis. One quarter of the children at three schools in Orrell, near Wigan, were now absent with influenza. In the West Riding of Yorkshire outbreaks were reported among steel workers in Sheffield and the Pakistani community in Bradford.

It would be profitless to follow the subsequent spread of influenza in similar detail. Once established in the community, the epidemic spread from its now numerous foci to involve in turn Lancashire and Yorkshire, the counties to the north and North Wales. The Midlands and the South Western area of England were widely affected by early September, closely followed from mid-September onwards by London, Surrey, Hampshire, Sussex and Kent, Essex and East Anglia. By this time the occurrence of the epidemic throughout the country was also demonstrable through the returns of first sickness claims received by the Ministry of Pensions and National Insurance. The following table shows this very clearly and confirms the evidence obtained by the laboratories. The table gives estimates of the start of the epidemic in each standard region, and the date when it reached its peak.

<i>Standard Region</i>	<i>Date of Commencement Week ending</i>	<i>Date of Peak Week ending</i>
Northern	27th August	1st October
East and West Riding	27th August	24th September
North Western	27th August	1st October
North Midland	27th August	8th October
Midland	27th August	8th October
Eastern	10th September	15th October
London and Middlesex	3rd September	15th October
Remainder of London and South Eastern	10th September	15th October
Southern	10th September	15th October
South Western	10th September	15th October
Wales	3rd September	1st October

The dates of commencement of the epidemic shown in the table are necessarily approximate and are almost certainly somewhat later than the appearance of the first cases in the regions concerned. The rapid rise in incidence took place on the whole about two weeks after the dates mentioned above. It is clear from these data that epidemic spread from the numerous foci began in the north of England. Shortly afterwards it occurred in the south. This is in agreement with virological evidence.

The epidemic in Wales

In Wales the epidemic followed much the same type of spread as it did in England but the incidence was probably lower. The disease was first manifested in small groups of children, several of them in camps. It then involved the rest of the population as well as a number of closed and semi-closed communities. The same heavy incidence was noted in school children. The greatest incidence throughout Wales came at the end of September and by 20th October the epidemic was subsiding rapidly or had ended. From all places involved there was laboratory confirmation of the diagnosis.

The Table on page 9 analysing the experience of one practice may be regarded as representative of the incidence of influenza in industrial Wales.

A noteworthy feature throughout was the slowness of the spread of the infection in the British Isles as compared with the speed with which it involved the Far East and some tropical countries.

Influenza in a general practice in Barry, Glamorgan, between 26th August, 1957 and 5th January, 1958
(Lennox, Caddick and Keble Williams, Personal communication)

New Influenza Cases			Age Groups																	
Week commencing	Number of new cases		Under 1 year		1-4 years		5-9 years		10-14 years		15-24 years		25-44 years		45-64 years		65 years and over			
	Male	Female	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
25.8.57	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—		
1.9.57	3	6	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—		
8.9.57	4	4	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—		
15.9.57	87	83	13	9	12	12	41	24	25	24	20	22	11	10	5	4	—	—		
22.9.57	246	239	31	27	51	52	69	44	64	58	44	44	20	51	12	17	—	—		
29.9.57*	215	263	31	38	57	57	69	44	37	44	44	43	33	51	11	15	—	—		
6.10.57	192	224	4	29	33	33	56	27	24	24	24	34	37	48	—	—	—	—		
13.10.57	77	105	9	14	14	15	14	15	6	5	14	28	20	25	12	16	—	—		
20.10.57	43	37	11	5	3	9	3	3	3	3	7	4	13	9	5	5	1	—		
27.10.57	14	12	2	1	2	2	2	2	—	—	1	3	6	3	2	2	1	—		
3.11.57	15	14	—	—	4	1	2	2	—	—	2	2	7	7	2	2	—	—		
10.11.57	8	12	—	—	1	—	—	—	—	—	—	—	4	3	—	—	—	—		
17.11.57	10	3	—	—	—	—	—	—	—	—	—	—	4	—	5	—	—	—		
24.11.57	3	2	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—		
1.12.57	3	1	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—		
8.12.57	3	9	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—		
15.12.57	1	2	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—		
22.12.57	3	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
29.12.57	4	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
TOTALS	933	1,029	8	11	128	131	201	201	161	158	175	189	218	220	60	72	11	18		
		1,962																		
Number in Practice	3,767	4,233	112	101	379	357	443	437	437	373	475	581	1,099	1,312	699	768	123	304		
Attack rate per cent. of patients at risk	24.5		7.1	11	33.8	36.7	45.4	46.0	36.8	42.4	36.8	32.5	19.9	16.8	8.7	9.4	9.0	5.9		

* During this week one partner was absent from illness and the records are known to be incomplete.

III

ESTIMATES OF INCIDENCE; INCUBATION PERIOD; AGE AND SEX DISTRIBUTION

Influenza is not a notifiable disease and there is consequently no formal record of its incidence which can only be estimated from such other data as may be available. A further factor militating against accuracy of ascertainment is that diagnosis must in the main rest upon clinical findings which cannot with certainty distinguish true viral influenza from other similar respiratory diseases. This complication did not occur to a serious extent in the first and main phase of the epidemic which took place in the Autumn of 1957, a season when other febrile respiratory illness is uncommon in this country. But in the early part of 1958 the outbreak carried over into the season of prevalence of respiratory illness with the result that it was impossible to judge to what degree the epidemic A2 strain of influenza was operative though virological studies revealed that it was still present.

An estimate has been made of the total number of cases of influenza occasioned by the epidemic in that part of the population gainfully employed and eligible for sickness benefit, based on the number of new claims to sickness benefit compared with the average in the corresponding period during the preceding 5 years. From 21st August, the week in which this increase, presumably due to influenza, was first perceived, until the end of 1957, there was an excess of some two million claims in an insured population of some 17½ million in the country.

Within the same age group (15-64 years) there are a further 12½ million uninsured persons. Conceding that these were affected to a like extent, 1½ million cases of influenza would have occurred in this group.

Scrutiny of reports from medical officers of health in all parts of the country suggests that nearly half of the school population was at some time during the epidemic absent from school because of influenza. With some 7 million children of school age, this represents a further 3½ million cases.

The incidence of influenza was relatively light in those under 5 years of age, about 3,300,000 in number and those over 64 years roughly 5,300,000 in number, but from information available from a number of sources it appears reasonable to estimate that a further half million cases occurred in these two groups.

In all, then, from consideration of all information available, there were almost certainly at least 7½ million persons in England and Wales who suffered some incapacity from influenza during the course of the epidemic.

The Epidemic Observation Unit of the College of General Practitioners made an analysis of information supplied by practitioners which suggested that some nine million persons in Great Britain had an attack of influenza, of whom more than five and a half million were attended by their doctors. This estimate refers to Scotland and Northern Ireland as well as England and Wales so that there appears to be reasonably close agreement between this and other estimates.

Incubation Period

The incubation period was 48-72 hours.

Age Distribution

The subject of age distribution has been mentioned in a number of investigations (Woodall, *et al.* Holland, *et al.*). In general it may be said that during 1957 the disease affected principally those aged between 5 and 39 years of age. Woodall's statistics show that one third of males and a similar proportion of females in this age group were attacked. The highest attack rate, 49 per cent., was shown by the age group 5-14 years. This is displayed in the following table.

Clinical attack rates by age and sex (Woodall, Rowson and McDonald)

Age—Years	Males		Females		Persons	
	At risk	Per-centage attacked	At risk	Per-centage attacked	At risk	Per-centage attacked
0-4	115	36	92	25	207	31
5-14	194	51	172	48	366	49
15-39	323	25	352	28	675	27
40-59	192	21	169	29	361	25
60 and over	55	15	68	10	123	12
All ages	879	31	853	30	1,732	31

This pattern of age incidence receives confirmation from Holland *et al.* who note that in the Royal Air Force the attack rate for acute respiratory disease during the epidemic was higher in recruit and boys' units than in permanent operational stations where personnel were older and more static.

It was thought that during the first four months of 1958 the elderly suffered more than younger members of the community but there are no statistics available to confirm this impression. In fact, Holland's investigations showed that in the post-epidemic period high sickness rates continued in the primary recruit units of the Royal Air Force but not in any other type of unit.

Sex distribution

There was no significant difference between the sexes so far as the incidence of influenza was concerned.

IV

MORBIDITY AND MORTALITY

It is difficult by an examination of vital statistics to be certain of the exact effect of a genuine epidemic of virus influenza due to a specific strain such as that described in this Report. Nevertheless, estimates of mortality sufficient for most purposes can be made, based on a study of death rates from all causes and from three specific causes of death which are most sensitive to the effect of an influenza epidemic; namely influenza, pneumonia and bronchitis.

As far as morbidity is concerned, a study of the number of new claims for sickness benefit (all diagnoses) made under the National Insurance Act, 1946, provides an indication of the effect of a widespread epidemic on the insured population. Since these figures are restricted to the insured, the effect of the epidemic on the uninsured, on children and on old people cannot be measured by this means.

The notification of acute primary pneumonia is compulsory in England and Wales although it is known to be very incomplete. Despite this there was a distinct upward swing in pneumonia notifications at the height of the epidemic.

A special aspect of influenza morbidity could be studied in 1957 for the first time. It was the number of cases discharged from hospital in England and Wales with a diagnosis of influenza and was based on a 10 per cent. sample of discharges from about 80 per cent. of hospitals in England and Wales.

The 1957 epidemic compared with previous years

Table A* shows the number of deaths from all causes and from influenza, pneumonia and bronchitis by quarters from the third (September) quarter of 1950 to the second (June) quarter of 1958.

Deaths from all causes were higher in the September and December quarters of 1957 than in the same period in previous years back to 1950. There were, during this period in 1957, a total of 262,191 deaths. The average number of deaths for the years 1950-56 for the same quarters was 228,760. The difference between these figures (33,431) produces a measure, albeit a very rough one of the toll in deaths taken by the influenza epidemic of 1957.

Although there was probably a continuation of the epidemic into the early part of 1958 the number of deaths during the first quarter of that year was less than in many previous years.

Out of the excess of about 30,000 deaths about half were reported as due to influenza, bronchitis and pneumonia and much of the remainder to the increased number of deaths from cerebro- and cardio-vascular disease which usually accompany an influenza epidemic. It should be remembered that the winter of 1956-57 was a very mild one and that the death rate for the first quarter of 1957 was much lower than in recent years. There would probably remain therefore a group of people who would have succumbed to a normal English

* The lettered tables are those in the Appendix pp. 60-72

winter. These people will be among those who are most prone to die in the presence of a relatively mild infection, or even with the onset of the colder weather. It is possible therefore that the figure of 30,000 is somewhat inflated as a result of the preceding mild winter, but it is impossible to estimate the extent of this.

The September quarter is usually the quarter with the least number of deaths from influenza, pneumonia and bronchitis. As far as the last two diseases were concerned the number of deaths in this quarter in 1957 was still fewer than in the other three quarters of the year although it was much higher than in the same period in previous years. However, the figure of 998 deaths assigned to influenza in the September quarter of 1957 was at least ten times more than in any previous year since 1950, when there were 102 deaths. This was followed in the December quarter by 5,230 deaths assigned to influenza, compared with 254 in the same quarter of 1956. There were 8,719 deaths from pneumonia which was more than in any similar quarter in the period 1950-1956 and approximately the same as is usual in the first quarters. Deaths from bronchitis in the last quarter of 1957 also showed a large increase although the number did not reach that usually observed in the first quarter of the year.

Deaths from influenza, pneumonia and bronchitis in the first two quarters of 1958 would not by themselves have given rise to comment. The experience of 1958 was similar to that of 1955 and 1956 and much more favourable than in 1951 and 1953.

Table B shows the number of new claims to sickness benefit by quarters from 1950-1958. Both the last two quarters of 1957 showed more claims than in any corresponding quarter in previous years. The figure for the December quarter, 3,542,900, was over half a million greater than in any quarter. The previous highest figure was for the first quarter of 1951 when there were 2,967,300 new claims.

Subtracting the average number of new claims for the last two quarters of the year (for 1950-56) from the figures for 1957 gives a figure of 2,418,000. It would thus appear that during this period over 2 million out of an insured population of about 17½ million suffered from the effects of influenza in a form severe enough to cause absence from work.

Table C gives the corrected notifications of pneumonia for the period July, 1950 to June, 1958. The figures are in line with those discussed above with the September quarter slightly higher and the December quarter much higher than in corresponding quarters of previous years. The first two quarters of 1958 showed that notifications were below the average for the previous seven years.

The evidence for a secondary wave in January, 1958, is not clear and it is very difficult to make any distinct separation from the seasonal rise in illness which takes place about that time. That influenza deaths were still occurring then is undoubted, and their secondary rise is evident. In the early weeks of almost every year deaths from bronchitis and pneumonia increase, and with this rise there is a simultaneous increase in deaths *attributed* to influenza but which may not have been *caused* by the epidemic virus or, indeed, by any influenza virus. Whether the rise in influenza deaths that occurred in January, 1958, was a secondary rise in response to an increase in bronchitis or pneumonia, or whether it was a genuine second wave of truly epidemic nature which contributed to the rise in bronchitis and pneumonia is something that cannot be determined by vital statistics alone.

New claims to sickness benefit July, 1957-June, 1958, are given in Table D.

Original notifications of pneumonia are shown in Table E by week and Standard Region. The pattern is similar to that shown in Table D but the rise in each region seems to have taken place about a week or a fortnight after the rise in new claims. While this may have been due to a slight delay in onset it is more probably due to the relative crudity of this method of measuring influenza morbidity.

Table F shows the number of deaths in the 160 great towns in England and Wales by week from all causes, and from influenza, pneumonia and bronchitis. Calculated figures for England and Wales deaths are also shown from July to December, 1957, and actual figures from January to June, 1958.

The weekly number of deaths from all causes is too crude a factor to allow many conclusions concerning the epidemic to be drawn from a study of it. Much more reliable are the numbers of deaths assigned to influenza, pneumonia and bronchitis and particularly the first.

The first sign of a rise in the number of deaths occurred in the week ended 7th September, 1957, when eight deaths from influenza were reported in the great towns. The number then rose rapidly reaching 592 and 607 in the weeks ended 12th and 19th October respectively. The fall was almost equally rapid, reaching 70 in the week ended 23rd November, but it was then halted. There was a small secondary rise in January, 1958, with a maximum of 155 in the week ended 11th January (315 in England and Wales). A steady fall again commenced, until by May and June the figures had reached about 13 deaths per week in England and Wales.

Deaths from pneumonia and bronchitis showed the same rise in September 1957, from weekly figures of about 140 and 130 respectively in August (great towns) to peaks of 572 and 502 in October. Although a fall in the weekly number of deaths from these two diseases did take place, it soon became merged with the seasonal rise, and the maximum number of deaths occurred in the week ended 4th January when there were 752 deaths from pneumonia and 905 from bronchitis in the great towns and 1,233 and 1,421 respectively in England and Wales. After February, as with influenza the weekly number of deaths began to fall off, reaching their minimum in June.

The distribution of deaths by age, sex and month of occurrence for all causes, and influenza, pneumonia and bronchitis is shown in Table G.

The peak that occurred in the deaths from all causes can be seen, but it is much more clearly shown in deaths from influenza. There were comparatively few deaths in the younger age groups, although a peak is noticeable for deaths in September and October in the 4 weeks—1 year age group. The death rate for influenza rose with increasing age as is shown in the table below.

Death Rates per million per annum from Influenza (Persons) 1957-58

	1957						1958					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
0- ...	3.7	3.7	162.8	284.6	68.9	59.9	85.0	28.9	9.8	16.8	3.3	3.4
5- ...	—	1.7	178.7	220.3	16.2	12.2	22.6	3.9	1.7	3.6	—	—
15- ...	—	4.4	194.1	229.7	22.6	41.5	15.2	19.3	10.9	15.7	—	—
25- ...	—	3.8	138.4	203.4	43.6	38.4	49.3	28.9	19.3	6.0	3.9	3.0
45- ...	3.0	4.0	368.7	1,082.7	258.3	201.6	263.1	154.4	66.3	58.4	11.0	6.2
65- ...	19.7	26.2	833.9	3,223.0	745.8	731.1	980.4	418.8	235.3	107.7	52.3	13.5
75 and over	19.6	45.8	844.6	5,470.6	1,871.6	1,849.7	2,640.5	1,355.1	849.7	405.4	85.0	60.8
All ages...	5.4	7.1	256.7	925.0	224.1	206.9	277.5	140.8	77.5	40.2	11.7	6.2

One point concerning the September-October peak is worthy of comment. Although in all age groups the maximum number of deaths from influenza occurred in October, the ratio of deaths in September to deaths in October falls with increasing age. This is shown in the table below.

	Age Group						
	0-	5-	15-	25-	45-	65-	75 and over
Number of deaths:							
1. September, 1957 ...	42	99	86	143	354	246	125
2. October, 1957 ...	76	126	151	281	1,074	983	837
Ratio of Line 1 to Line 2	0.55	0.79	0.57	0.51	0.32	0.25	0.15

This may mean that the first wave of the epidemic involved the younger people, only affecting the older people later. Alternatively, the epidemic might have affected young and old simultaneously but while the young person recovers quickly, the older is more liable to complications which do not bring about death until later. The underlying cause in such cases is quite properly reported as influenza. The rise in the number of deaths which occurred in January, 1958, was limited to the upper age groups.

The death rates per million per annum for pneumonia and bronchitis are shown in the table below.

Death Rate per million per annum from Pneumonia (Persons) 1957-58

	1957						1958					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
0- ...	303.4	314.6	465.1	561.8	546.5	1,003.7	970.6	956.7	800.7	616.2	346.4	235.9
5- ...	14.0	8.7	74.0	64.7	23.5	26.2	22.6	13.5	38.3	19.8	15.7	9.0
15- ...	21.8	15.3	65.5	67.7	18.1	32.8	34.8	36.1	19.6	29.2	15.2	9.0
25- ...	20.6	15.0	84.2	101.1	42.6	88.1	78.3	62.1	41.5	45.0	24.2	32.0
45- ...	144.2	114.9	385.4	658.3	343.8	666.3	675.7	465.6	421.7	339.2	168.7	136.9
65- ...	645.9	718.0	1,345.8	2,491.8	1,755.9	3,134.4	3,192.8	2,324.9	2,098.0	1,888.9	1,019.6	771.0
75 and over	3,437.9	3,339.5	4,560.8	7,790.8	6,702.7	11,869.3	12,836.6	10,572.5	9,601.3	8,351.4	4,712.4	4,033.8
All ages	258.8	251.4	465.7	785.0	554.9	1,002.9	1,049.6	828.6	743.9	640.8	351.9	289.9

Death Rate per million per annum from Bronchitis (Persons) 1957-58

	1957						1958					
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June
0- ...	71.2	59.9	69.8	104.9	116.3	209.7	245.1	216.6	166.7	114.5	98.0	30.3
5- ...	—	7.0	18.1	17.5	1.8	5.2	10.4	3.9	8.7	5.4	3.5	7.2
15- ...	2.2	8.7	6.8	13.1	4.5	10.9	8.7	19.3	4.3	6.7	6.5	2.2
25- ...	15.0	18.7	25.2	45.1	29.0	60.9	65.7	41.8	42.5	37.0	19.3	14.0
45- ...	244.0	224.8	464.6	839.7	701.0	1,369.1	1,644.6	1,086.7	901.6	675.3	342.4	320.5
65- ...	1,114.8	1,163.9	1,637.3	3,554.1	2,715.3	5,803.3	6,251.6	4,454.9	3,673.2	2,976.4	1,598.0	1,340.1
75 and over	2,385.6	2,235.3	3,114.9	6,333.3	5,945.9	12,817.0	13,882.4	10,963.8	9,065.4	7,310.8	3,960.8	3,168.9
All ages	257.7	252.8	392.0	780.3	654.8	1,404.6	1,521.3	1,108.1	916.5	726.5	389.2	324.7

The picture for pneumonia is similar to that for influenza in September and October, but is confused by the normally occurring pneumonia deaths. The winter rise in deaths from pneumonia was probably slightly complicated by the recurrence of the influenza epidemic on a smaller scale, and as a result the number of deaths in the older age group rose above the peak reached in October.

There was an outbreak of pneumonia among infants in the winter of 1957-58 which is shown in this table. It was not thought to be related to influenza. There was no evidence of any simultaneous rise in influenza and bronchitis deaths in the same age group.

The September-October peak is present in deaths from bronchitis but was restricted to persons of 45 and over, and was not very marked. The number of deaths in January, 1958, assigned to bronchitis in the older age group was about twice as great as in October of the previous year.

Up to the age of 45, deaths from influenza occurred in approximately equal numbers among males and females but above that age male deaths predominated, the sex ratio falling again among those aged 75 and over. For pneumonia and bronchitis male deaths predominate throughout except for deaths from pneumonia among persons aged 75 and over. This is the normal pattern for deaths from these two diseases.

Corrected notifications of pneumonia by sex and age and quarter are shown in Table H. With the exception of the 0-5 age group notifications were most numerous in the December quarter.

The effect of the Epidemic on 1957 Death rates

The table below shows the death rate per 1,000 living in 1957 and the percentage changes in the rate compared with 1956.

Age Group	Death rate per 1,000 living, 1957		Percentage changes in death rate in 1957 compared with 1956	
	Male	Female	Male	Female
1-	1.04	0.90	+ 6.1	+ 8.4
5-	0.48	0.34	+ 4.3	+ 3.0
10-	0.44	0.30	+ 7.3	+11.1
15-	0.91	0.45	+15.2	+25.0
20-	1.15	0.54	+ 7.5	+ 1.9
25-	1.19	0.86	- 1.7	- 1.2
35-	2.50	1.92	+ 0.4	+ 1.1
45-	7.51	4.56	+ 0.8	+ 0.9
55-	22.3	11.2	+ 0.9	—
65-	54.0	30.9	- 0.4	- 2.8
75-	119.9	84.2	- 6.0	- 6.6
85 and over	226.8	199.2	-11.5	-10.6

Data in a table such as this are compounded from many factors and childhood infectious diseases were responsible for some of the increase in the death rates at the younger ages. Nevertheless with the single exception of the 25-34 year age group, increases occurred in the death rates at all ages up to 54. Much of this was due to influenza. The large percentage increases which occurred among adolescents and young adults were due to there being so few deaths normally in these age groups that even a small absolute increase in the death rate produced a large relative increase. At the older ages, despite the fact that the epidemic caused more deaths among the old, it was not severe enough to overcome the mitigating effect of the mild winter in the early part of the year.

Fatality Ratio

It is virtually impossible to estimate the fatality of the influenza epidemic because of the absence of comprehensive morbidity figures for all age groups. That the disease was relatively mild, though widespread, is certain, but to say more than this is difficult. Estimates have ranged from 13 to 35 deaths per 10,000. Despite this comparatively low ratio of deaths to cases, indicative of the general mildness of the disease, the total incidence of cases during the epidemic was so high that many thousands of deaths resulted.

Morbidity in Hospital

The table below shows the estimated number of admissions to and deaths in hospital with influenza, pneumonia and bronchitis in England and Wales during the last six months of 1957.

	July	Aug.	Sept.	Oct.	Nov.	Dec.
Estimated Number of Admissions	5,670	5,796	16,834	28,186	13,432	16,216
Estimated Number of Deaths (by date of admission) ...	1,096	1,197	2,129	3,755	2,407	3,339
Fatality Rate per cent. ...	19	21	13	13	18	21

As with all other data there was a very noticeable rise in admissions in September and October, 1957. During these two months it would appear that hospitals in the National Health Service admitted something between 25,000 and 30,000 more cases of acute respiratory infection than would be expected at that time of year.

The hospital fatality rate fell during the epidemic. There were probably two reasons for this. Firstly, during the epidemic more young patients with a lower fatality rate would have been admitted, and secondly, even among the older patients there were more admissions of those with a good prognosis.

The effect of the epidemic on the hospital service can be judged from the following table, which shows the estimated number of admissions with influenza, pneumonia and bronchitis and the number of other immediate admissions and admissions from the waiting list.

	<i>Estimated Number: Thousands</i>					
	July	Aug.	Sept.	Oct.	Nov.	Dec.
Admissions with Influenza, Pneumonia and Bronchitis...	6	6	17	28	13	16
Other Immediate	125	122	114	118	118	116
All Immediate	131	128	131	146	131	132
Waiting List Cases	136	111	114	109	127	100
All Admissions...	267	239	245	255	258	232

This table shows that influenza, pneumonia and bronchitis accounted for nearly all excess admissions during the epidemic in contradistinction to the deaths of which only half were assigned to respiratory conditions. As might have been expected, the increase in immediate admissions produced a fall in the admission of cases from the waiting lists. This fall was made good to some extent in November.

V

CLINICAL STUDIES

In an outbreak of the magnitude and relative mildness of the influenza of 1957-58, the most truly representative portrayal of the clinical features of the epidemic must come from doctors in general medical practice for they attended the great majority of cases. Hospitals on the other hand received only the most seriously ill, either from the disease itself or on account of complications. In describing the clinical features of the epidemic a more balanced presentation will therefore result if a description of the disease as met with in general practice is given and followed by an account of its salient features as seen in patients admitted to hospital.

INFLUENZA IN GENERAL MEDICAL PRACTICE

Detailed reports have been published by several observers of the impact of influenza on individual medical practices (Fry; Woodall, Rowson and McDonald). The Epidemic Observation Unit of the College of General Practitioners has published an analysis of information contributed by members and associates in 42 practices caring for some 150,000 patients in different parts of the British Isles. In the East Midlands division of England Dr. G. V. Davies of this Department carried out an informal inquiry of all general medical practitioners in that area and received 190 replies in respect of approximately one million persons on practitioners' lists. In Salford, the Medical Officer of Health carried out a similar inquiry of practitioners participating in the influenza-spotting scheme in that County Borough.

The consensus of opinion was that the illness was, in general, mild. The onset was often sudden but by no means invariably so. Fever, cough and headache were predominant symptoms, with sore throat, nasal symptoms, aches and pains and shivering the next most frequent complaints. In children under school age drowsiness, general malaise, vomiting and epistaxis were frequently noted, while delirium was particularly observed in school children. Slight cyanosis in men over 50 was reported by Burn in Salford (Burn, J. L., personal communication) though this sign did not carry the grave prognostic significance of such an appearance in the pandemic of 1918-19. Many minor variations in clinical pattern were recorded not only by different observers but even by the same observer at different places. The duration of the febrile stage of the illness was usually three to five days. There was a variable period of convalescence. Post-influenzal debility was neither particularly frequent nor severe. In a small proportion of patients a recurrence of symptoms was experienced about two to three weeks after the first onset.

The following table from Woodall's paper illustrates the frequency of the main symptoms seen in patients of different ages in a general practice:

*Clinical features of 187 illnesses in serologically confirmed
family outbreaks*

Age-group	0-4 years (24 cases)	5-14 years (71 cases)	15-39 years (70 cases)	40+ years (22 cases)	Total (187 cases)
	per cent.	per cent.	per cent.	per cent.	per cent.
<i>Onset</i>					
Gradual	50	48	61	55	54
Sudden	50	52	39	45	46
<i>Symptoms</i>					
Cough	84	83	93	82	87
Headache... ..	8	65	92	82	70
Sneezing	75	63	67	73	67
Nasal symptoms...	62	62	71	59	65
Sore throat	17	56	73	55	57
Sweating	37	46	61	68	48
Shivers	8	41	59	59	46
Aches and pains ...	12	17	73	59	42
Malaise	33	7	17	18	15
Prostration	17	13	26	9	14
Drowsy	54	11	0	0	11
Delirium	4	21	3	5	10
Nose bleeds	17	8	9	0	9
Faint and giddy ...	0	4	10	14	7
Hoarseness	8	1	6	9	5
Vomiting	29	23	11	9	18
Abdominal pain ...	0	10	9	0	7
Diarrhoea	8	4	1	0	3
<i>Complications</i>					
Pneumonia	4	3	1	9	3
Otitis media	4	3	0	0	2
Most frequent initial symptoms.	<div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 2em; vertical-align: middle; margin-right: 5px;">{</div> <div style="display: inline-block; vertical-align: middle;"> Cough Drowsy Cough Drowsy </div> </div>	Headache	Headache	Sore throat	Headache
Most troublesome symptoms ...		Sore throat	Sore throat	Headache	Sore throat
		Headache	Headache	Headache	Headache
Days fever (median)	3	2	3	3	3
Days in bed (median)	2	3	3	3	3

The writers of the paper comment "Some of the age differences in symptomatology can probably be attributed to the young being less able to describe their troubles; thus it is not surprising that sore throat, headache, and aches and pains were infrequent in those under 5 years of age, whereas malaise was relatively prominent. Other differences, however, may be more real—for example the greater frequency of drowsiness, vomiting, diarrhoea, and nose bleeds in the young, or delirium in children of school age, and of aches and pains and faintness or giddiness in adult life."

Of unusual interest was the experience of Breen and his partners in Bradford where the epidemic occurred in two overlapping phases, the first confined to the local Pakistani community and the second affecting all nationalities.

In the first phase, which lasted from 6th July until 26th August, the first patient suffering from influenza was seen on 5th July, having arrived in this country by air from Pakistan 24 hours previously.

Infection spread rapidly, in part because of the custom of visiting the sick in large numbers and in part by reason of the greatly overcrowded unventilated homes.

The second phase in the general population of the practice began on 15th August to end on 18th October, reaching its maximum between 12th and 28th September, during which time as many as 100 cases of influenza were seen daily. As it happened, the first twelve cases were in West Indian textile workers, but all races were affected.

Severe headache, pains in the limbs, fever and, later, profuse sweating were common to patients in both phases, but certain differences were observed:—in the first, no complaint was made of sore throat, neck pain or stiffness, or vomiting; all ages were affected, but with few complications and little residual weakness.

In the second phase, almost all complained of sore throat; neck pain, even mild meningismus was frequently met. Vomiting was not unusual in children. The main incidence of the disease was in those under 40, complications were more frequent and subsequent lassitude marked.

Infection conferred immunity, so that relatively few Pakistanis were affected during the second phase. It was noted that the type of illness became more severe as the epidemic advanced, and thus the differences observed during the two phases may have been essentially temporal and only incidentally racial.

Treatment of uncomplicated cases

In an epidemic fortunately relatively free of complications, treatment of the uncomplicated case was primarily rest in bed with its attendant isolation and simple antipyretic measures to which patients in general responded extremely well. Many patients made do with simple homely treatment and never sought medical advice, others were convalescent when they first came under medical notice—and then principally for certification of incapacity rather than for active treatment.

In passing, it may be mentioned that isolation at home in bed enables an influenza patient to avoid his neighbours' bacterial flora quite as much as it protects the community from the patient's influenza.

Antibiotics

There was considerable difference of opinion about the use, as in the choice, of antibiotics in uncomplicated influenza. While some physicians prescribed antibiotics in all cases as a routine safeguard against secondary infection others restricted this prophylaxis to the very young, the aged and those with pre-existing chest disease; others again withheld chemotherapy until there was some specific indication.

Of 930 patients treated by Fry, none received chemoprophylaxis, and antibiotics were found necessary in only 24 patients with complications. Of these, "20 received penicillin intramuscularly and 4 oxytetracycline orally. No patient required admission to hospital and no patient died from the direct or indirect effects of influenza."

Burn reported similarly from Salford, where one practitioner treated 497 cases of influenza by rest and a simple antipyretic and in only six patients was antibiotic therapy required. In the same area, another practitioner gave all of several hundred patients with influenza "at least 100,000 units penicillin intramuscularly. This latter treatment was given by many practitioners to

patients with signs of respiratory distress, the injections being given daily for five days." The evidence provided by these and many similar reports from all parts of the country confirms the view that the indiscriminate use of antibiotics in the treatment of influenza is in no way beneficial. While these remedies should certainly be given when indicated their unnecessary use must be deprecated.

Complications

Not every patient made an uninterrupted recovery. In two practices for which the recorded incidence of complications has been published (Fry; Woodall *et al.*) pneumonia occurred in 3 per cent. of cases of influenza and otitis media in 2 per cent. and 1 per cent. respectively. While many of the 190 replies received by Davies agreed with these findings one or two practitioners reported that influenza had been a serious illness with frequent complications.

Fatality

The most comprehensive study of fatality from influenza as seen in general practice is that made by the College of General Practitioners. For 29 practices information was available of the numbers of patients attended for influenza and of deaths directly ascribed to the disease, and for a further 13 practices the number of deaths from influenza was known, but not the total treated for this disease. A total of 29 deaths from influenza occurred in the 29 practices, a fatality ratio of 2.3 per thousand cases attended.

INFLUENZA IN HOSPITAL PRACTICE

General

There is remarkably little published work on influenza as met in hospital practice in England and Wales during the Autumn of 1957. In fact, the only comprehensive account has been given by Bashore and his collaborators. They describe the clinical features of the disease as seen in 1,264 influenza patients admitted to an Air Force hospital in the United Kingdom between 11th August and 21st December, 1957.

These patients were not strictly comparable with those admitted to civil hospitals inasmuch as they formed part of a younger age group in a better pre-existing state of health than the general population. Moreover, any patient suffering clinically from influenza was admitted whereas civil hospitals took only patients who were seriously ill. The sex ratio of the Air Force patients was also different, 82 per cent. were adult males, 7.4 per cent. adult females and 10 per cent. were children. The ages of the adults ranged between 14 and 45 years with an average of 23.3 years. The child patients ranged in age from 4 months to 13 years.

All patients were given a comprehensive clinical, laboratory and X-ray examination on admission to special isolation wards.

The most common symptoms at the time of admission are shown in Fig. 1. The term malaise includes myalgias which varied from generalized aching to low back pain.

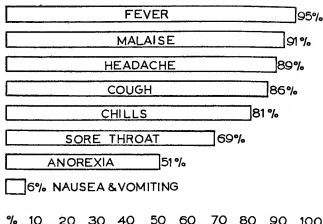


FIG. 1. Frequency of specific symptoms in 1,264 cases of Asian Influenza.
(Bashore *et al.*, 1958)

Complications occurred in six per cent. of cases. Pneumonia was the most common and most severe amounting to 4.3 per cent. Also noteworthy were sinusitis and otitis media, each 0.6 per cent., and pharyngitis and tonsillitis 0.5 per cent. The frequency of pneumonia in adult females was high and 10 of the 14 adult female patients showing this complication were pregnant.

As in previous epidemics the outstanding causes of admission to the civil hospitals were respiratory complications. The national "Hospital Inpatient Enquiry" analysis of a ten per cent. sample of patients reveals that between 25,000 and 30,000 additional cases of acute respiratory infection were admitted to hospitals of England and Wales during September and October, 1957.

Pressure on Hospitals

The demand for hospital accommodation appears to have been heavy in the north. During September and October, 1957, in the area covered by the Liverpool Regional Hospital Board the number of discharges from departments of general medicine was 5,191, an increase of 27 per cent. compared with an average of 4,087 for the same two months during the years 1953-56 inclusive. The total discharges from the departments of general medicine during the months of September and October for the years 1953-1957 were as follows:

1953	1954	1955	1956	1957
3,933	4,214	3,870	4,331	5,191

Pressure on hospitals may also be gauged from the following figures for Liverpool and London. The first series are the figures for total admissions through the Emergency Bed Bureau, Liverpool, during the months of September and October of the years indicated.

1953	1954	1955	1956	1957
1,781	1,710	1,671	1,654	2,808

In London the Emergency Bed Service dealt with the following number of patients suffering from acute respiratory disease in the period 23rd September to 5th November which corresponds with the Liverpool period of epidemic incidence as follows:

1954	1955	1956	1957
734	924	1,015	2,477

Complications

Pneumonia

Of respiratory complications pneumonia was the most frequent. Its course and outcome were greatly influenced by the presence or absence of secondary staphylococcal infection and the presence of pre-existing disease.

The general pattern of influenzal pneumonia in the recent epidemic was fairly uniform throughout England and Wales as a whole. The onset resembled that of influenza in general. Within 24 hours pneumonic or other serious symptoms were observed in one third of patients. Deterioration was much more rapid in the young than in the elderly; in one large series, 56 per cent. of those patients under 5 years of age were gravely ill within the day compared with 16 per cent. of those over 64 (P.H.L.S. Series).

Severe dyspnoea was usual; cyanosis occurred in about one third of cases and haemoptysis occasionally. In fatal cases deterioration was rapid after the onset of pneumonia. In one series of 477 deaths (P.H.L.S.) no fewer than 86 occurred before admission to hospital, two thirds within 48 hours of admission and the majority within 7 days of the onset of the illness.

Staphylococcal infection

The presence of the staphylococcus rendered the prognosis grave. This was noted early in the epidemic and continued throughout. It was the subject of comment by several observers. Of the published reports, that by Oswald and his colleagues in London may be quoted as representative of general experience. The accompanying table compares fatality in relation to age and sex in a series of 155 staphylococcal and 145 non-staphylococcal pneumonias studied

Fatality in Relation to Age and Sex

	Total	Age (Years)				Sex	
		0-14	15-34	35-54	55-	Male	Female
Staphylococcal pneumonia	Cases ... 155	10	74	28	43	98	57
	Deaths ... 44	3	19	8	14	25	19
	Percentage ... 28	30	26	29	33	26	33
Non-staphylococcal pneumonia	Cases ... 145	10	38	35	62	86	59
	Deaths ... 18	—	1	1	16	11	7
	Percentage ... 12	—	3	3	26	13	12

in the ten London undergraduate teaching hospitals, certain other hospitals in London and further cases in the three Services. This table demonstrates clearly the greater fatality of staphylococcal pneumonia at all ages.

In those who survived, staphylococcal influenzal pneumonia was also a more severe illness. In Oswald's series of 121 who recovered from this complication 37 had an illness regarded as "severe", 65 were "moderately ill" and

in only 19 was the course of the disease "mild". By comparison, among 127 who recovered from other forms of influenzal pneumonia, the illness was severe in only 16, in 69 it was moderate and in 42 mild.

With staphylococcal pneumonia the median duration of symptoms before admission was five days and in other pneumonias four; the length of stay in hospital 26 days as against 16; and the median duration of fever in survivors was eight compared with four days or, after allowing for previous duration of illness at home, two weeks compared with eight days.

As may be seen from the following table X-ray investigation showed the much greater extent of lung tissue involved in staphylococcal pneumonia. In 37 per cent. of cases in this group three or more zones were involved, but in non-staphylococcal pneumonia only 19 per cent.

Result of X-Ray examination at Height of Disease

	Total		Number of Zones involved				Abscess	No Radio-graph taken
			1	2	3	4 or more		
Staphylococcal pneumonia	Number ...	155	27	44	27	30	21	27
	Deaths ...	44	2	4	4	11	—	23
	Percentage ...	28	7	9	15	37	—	85
Non-staphylococcal pneumonia	Number ...	145	65	38	16	12	2	14
	Deaths ...	18	—	4	3	6	—	5
	Percentage ...	12	—	11	19	50	—	36

In a series of 13 cases of influenzal broncho-pneumonia reported by Morgan and Pickup from the West Riding of Yorkshire there were 5 deaths. Post-mortem examinations were made in two cases. In both, solid haemorrhagic patches were found in the lungs, measuring up to 6 cm. across, and trachea and bronchi contained bloodstained purulent frothy material. *Staph. aureus* was found in one of these cases. This series illustrates also the varying severity of influenza in adjoining areas—of the 13 children admitted to hospital with influenzal broncho-pneumonia, twelve were from the Pontefract and one from the Wakefield district. In both localities the incidence of influenza was much the same, but severe cases were much more frequent in the Pontefract area.

Lung abscess

In 41 adults admitted to a group of hospitals in Bromley, Farnborough and Beckenham, Kent, during October, 1957 with pneumonic complications of influenza, Angeloni and Scott report 15 in whom *Staph. aureus* was cultured from the sputum, six of the strains being penicillin-resistant. Of the 41 patients, 8 developed lung abscesses—ranging from a solitary lesion at the apex of the right lower lobe to multiple cavities spread throughout both lungs. All these patients with lung abscess recovered more or less completely. In six of the eight *Staph. aureus* was cultured from the sputum, in one a beta-haemolytic streptococcus was obtained, the remaining case yielded no pathogen. Of the six with staphylococcal lung abscess, 3 harboured strains which were resistant to penicillin though sensitive to other antibiotics.

In Oswald's series of patients in London, lung abscess was found by X-ray in 25 patients, 21 of those with staphylococcal pneumonia (14 per cent.) and 4 with other forms of pneumonia (2 per cent.). The true incidence may well have been higher, the authors comment, because consolidation often obliterated the ring shadows of abscesses, as was evident on comparing radiographs with post-mortem findings. Abscesses were frequently not demonstrable until late in the course of the disease when pneumonia had resolved, and patients had recovered except for excessive purulent sputum. With antibiotic treatment most pyogenic abscesses cleared rapidly—by the end of the short period of observation possible 13 had resolved entirely, 5 had become hairline cysts, 2 continued as thin walled cavities and one remained a rather thick walled cavity at the end of two months, and all four of the abscesses in which pyococci were not detected resolved with treatment.

Lung abscess was also reported in 4 of 46 influenza deaths studied by Giles and Shuttleworth and in 18 per cent. of 219 deaths investigated by the Public Health Laboratory Service.

Pre-existing disease. The adverse effect of pre-existing illness was commented upon, both in reports currently received by the Department from many sources and in accounts later published in medical journals.

Chronic bronchitis was present in 84 of 379 patients studied by Oswald and his colleagues in London, in 56 of 125 reported by Walker and in 13 of 41 seen by Angeloni and Scott in Bromley.

Mortality was high in these patients—of Oswald's series 25 died (30 per cent.) and of the Bromley series 6 died (46 per cent.) all of whom had suffered from long-standing pulmonary disease.

Chronic heart disease was an equally serious handicap. Of 379 patients in Oswald's series, ischaemic heart disease was present in 11 (with 6 deaths) and hypertensive heart disease in 6 of whom 2 died.

Eight had rheumatic heart disease (6 mitral stenosis and 2 aortic incompetence) of whom 4 died.

Diabetics, too, fared badly—of 9 in Oswald's series, 6 died, 4 of whom were admitted in coma.

Late pregnancy, while a physiological condition and not a disease, adversely affected the course of influenzal pneumonia in 7 of the same series—2 died (one had mitral stenosis in addition), 4 were delivered at the height of their illness and all were gravely ill.

Fulminating influenza

In a number of cases the disease took the acute course well described as "fulminant", the cardinal features being the short duration of illness and the severe toxæmia.

In the series reported by Oswald *et al* there were 132 patients with fulminating influenza, the symptoms being prostration (55 per cent.), cyanosis (80 per cent.), pallor (12 per cent.), mental disturbance (48 per cent.), excessive dyspnoea (62 per cent.) and blood-stained sputum (36 per cent.). Staphylococcal pneumonia complicated 71 (54 per cent.) of cases, and there were 76 (58 per cent.) deaths. In the management of fulminating influenza these authors stressed the imperative need for immediate treatment to combat collapse. So far as this is due to adrenal damage (for which there was some post-mortem evidence) or

impairment, substitution therapy appeared to them a logical measure to counter circulatory collapse associated with toxæmia. Accordingly, some 27 patients in this series received steroid therapy, 100 mg. hydrocortisone intravenously followed by 50 mg. 6- or 12-hourly. Of these, 17 died, 8 within hours of admission. The survivors among those given hydrocortisone were those with a reasonably free airway whose pneumonia responded quickly to antibiotics.

Obstructed airway

Obstruction of the airway occurred in a certain number of cases in all reported series. In that of Oswald *et al*, there were 9 such cases. In six, tracheo-bronchial intubation was performed to establish an effective airway and allow the aspiration of inflammatory products. Of the six, three survived. In retrospect these authors considered this procedure might well have been more widely adopted and undertaken earlier. The same authors reported that bronchoscopy, while simpler and allowing aspiration of the larger bronchi under direct vision, was less well tolerated and therefore reserved for acute emergencies. Of three thus treated, all survived.

Other respiratory complications

Pleural effusion or empyema was present in a proportion of cases—in 5 of 219 of the Public Health Laboratory Service series, one of 13 in Morgan and Pickup's series, six of 224 non-staphylococcal pneumonias and 18 of 155 staphylococcal pneumonias in Oswald's cases. In four of these last the effusion was purulent, one being associated with ruptured lung abscess and pyo-pneumothorax. All recovered, in the main uneventfully. Three of the empyemata required aspiration followed by penicillin instillation. Aspiration followed by pleural decortication was required in the fourth.

Cardiovascular complications

Acute myocarditis due to toxæmia was considered to have been the immediate cause of death in a few cases of fulminating influenza.

In two cases of fatal staphylococcal pneumonia cited by Oswald, the post-mortem findings in one showed a dilated heart and pale soft myocardium of clay-like consistency with subendocardial haemorrhages throughout the left ventricle, and in the other a dilated heart with soft white clay-like myocardium and a few small abscesses in the wall of the left ventricle.

Emboli

Embolic spread outside the thorax was seen only with pyogenic infection. Four cases were recorded by Oswald; one of cerebral infarction and meningitis, another which developed emboli of toes and fingers and acute arthritis of the knee, and a third with a septic infarct of the foot which required incision.

Adrenal haemorrhage

The rapid deterioration almost from the beginning which was observed in so many fatal cases may in certain instances have been due to adrenal haemorrhage.

Eight such cases were recorded in 219 fatalities analysed by McDonald of which five were aged four years or under and two were between five and 14 years old.

Central nervous system

Mental changes were noted in influenzal pneumonia by many observers, ranging from confusion and delirium to coma.

Neurological complications were observed in a small proportion of those admitted to hospital. Flewett and Hoult described 18 such cases in the Birmingham area. In six, all fatal, there was a history of convulsions or of clinical encephalitis at the height of an attack of influenza. Asian-type virus was found in the lungs in five cases and in the brain in one. In this last case the authors emphasised the possibility of contamination of the brain in the post-mortem room. In reporting the association of influenza with the cerebral symptoms and post-mortem findings Flewett and Hoult observed that the changes seen could have been caused by anoxia accompanying severe pneumonia and were not necessarily a specific result of viral activity. On balance, the authors preferred the term "encephalopathy" to encephalitis.

In four non-fatal cases so-called encephalitis followed an attack of influenza, and in a further two patients (one of whom died) an ascending motor and sensory disturbance of the Guillain-Barre type succeeded an influenzal attack.

In all 18 of these cases there was serological evidence of infection with the Asian strain of influenza virus, but again the authors point out the high degree of probability of any hospital patient presenting such evidence of influenzal infection at that stage of the epidemic. There were a further six cases of sequelae referable to lesions of the central nervous system following an influenza-like illness, but with no laboratory confirmation of the influenzal element of the illness. This group the authors describe as "misleading cases", illustrating the many diagnostic pitfalls that beset the whole subject of post-influenzal encephalitis.

McConkey and Daws reported from Cardiff four cases of severe neurological disorder following an illness resembling influenza. In three the symptoms were those of encephalitis while in the fourth (the only one in which there was a pleocytosis in the cerebrospinal fluid) the illness resembled lymphocytic choriomeningitis. In all four patients there was serological evidence of recent infection with influenza A/Asian, and in the fourth case the antibody titres for influenza C and for mumps were also raised. The first two patients in this series were brother and sister; another sister had headache and drowsiness four or five days after influenza but recovered without treatment. The parents and one other child had influenza also. Complement fixation and haemagglutination inhibition tests on parents and the child with the transient neurological illness supported the diagnosis of influenza. These four patients recovered.

Dubowitz reported two cases of encephalitis in two school children from Caterham. In one the cerebral symptoms arose two weeks after a severe cold; during her stay in hospital this girl's complement fixation titre showed no further rise from 1:64 in serum taken four days after admission. In the second patient cerebral symptoms occurred 3-4 days after the onset of an influenzal illness; this boy's C.F. titre showed a fourfold rise during the next two weeks. Both patients recovered.

Goodbody and McGill described three cases (two fatal) of typical acute haemorrhagic leucoencephalitis seen by them during the 1957-58 epidemic and three other cases seen by them since 1953. Five occurred during epidemics of influenza, and all had a history of an influenzal illness. In some, encephalitis began during a relapse after apparent recovery. Bronchitis or bronchopneumonia was present in all cases. In the three fatal cases the microscopic appearances of the brain were those of a haemorrhagic encephalitis confined to the white

matter. Histologically, the changes found included necrosis of vessels, perivascular oedema, leucocytic exudation, haemorrhage and demyelination, these changes, in the opinion of the authors, not being caused by simple anoxia and venous congestion. Symptoms typical of viral encephalitis were observed in several of Oswald's cases of which four were reported in some detail. In two which recovered the clinical features were those of meningeal irritation, and of two fatal cases which came to autopsy cerebral venous congestion was found in one and staphylococcal pneumonia with lung abscess, septic cerebral infarction and meningitis in the other. No microscopic evidence of haemorrhage or encephalitis was found in the first case. Thus, excluding the death from septic emboli, there were three cases in which "there was firm clinical evidence of encephalitis but pathological proof was lacking."

It seems, therefore, that a number of cases of acute haemorrhagic leucoencephalitis corresponding to that originally described by Hurst were observed during 1957-58. This condition is not rare and is usually preceded by an upper respiratory infection, not necessarily influenzal.

The cases of the sort reported in 1957-58 do not appear to indicate some special neurotropic effect of the Asian variant. Other studies undertaken by Flewett and Hoult afforded no support to the belief that the Asian variant was neurotropic or capable of becoming so. It is more reasonable to regard encephalitis as one of the possible sequelae of upper respiratory infection whether or not it is caused by influenza virus.

Minor disorders of the nervous system observed included transient peripheral neuritis and post-influenzal depression.

VI

LABORATORY DIAGNOSIS

ARRANGEMENTS FOR THE LABORATORY INVESTIGATION OF INFLUENZA-LIKE ILLNESSES

The Public Health Laboratory Service

At the time of Parsons' report, bacteriology was in its infancy, and when Newman described the influenza pandemic that accompanied and succeeded the closing stage of the first world war, virology stood very much in the position occupied by bacteriology in 1890, namely that it appeared probable that research in the field of virus diseases would be at least as illuminating and rewarding as had been the study of diseases of bacterial causation. During the past quarter of a century a great extension of our knowledge of the influenza viruses has occurred and laboratory facilities available for the routine examination of specimens and for reference purposes at national and international level have correspondingly increased.

Furthermore, isolation by cultural methods of the causal virus from the patient's secretions provides direct proof of the diagnosis of influenza.

In addition, two serological techniques are in common use in the diagnosis of influenza, the haemagglutination-inhibition test and the complement-fixation test.

In 1941, MacClelland and Hare, and Hirst, independently showed that influenza virus agglutinates red cells. At the same time Hirst described a technique for measuring the degree of agglutination, this method being later modified by Burnet and Clarke (1942).

The complement-fixation test, carried out on paired sera and extensively used by the Public Health Laboratory Service, is the outcome of the original work of Fairbrother and Hoyle (1937) on the group specific "soluble" antigenic component of the influenza virus and its property of fixing complement.

The establishment and development of the Public Health Laboratory Service, foreshadowed by the Emergency Public Health Laboratory Service of the second world war, has provided a network of laboratories covering the whole country, together with reference laboratories at the Service's central laboratory at Colindale and at other regional centres. Originally built up as a bacteriological service, it now deals, in addition, with virology. Thirty-four of these laboratories undertake serological tests for influenza A, B and C, the adenoviruses, Q fever, psittacosis, and atypical pneumonia and 20 of these centres cater for the isolation of influenza virus. All laboratories are in a position to offer advice on the collection and transport of specimens, and have facilities for their reception. In the presence of an outbreak of acute respiratory disease in his area the medical officer of health can thus seek the help and advice of his local Public Health Laboratory. Medical officers of hospitals, schools, factories, the Services, and other bodies make similar use of the Service. The medical officer of health can also consult on matters of this sort with the medical staff of the Ministry of Health.

Serological Tests

Serological diagnosis depends on the demonstration of an increase in the titre of complement-fixing or of haemagglutinin-inhibiting antibody during the course of the illness. Complement-fixing antibody begins to appear at 10-15 days and reaches a maximum titre some 15-30 days after the onset of illness.

Serological tests can be carried out rapidly and at little cost though 2 or 3 weeks must elapse between the taking of the first specimen by the clinician and the receipt of a report from the laboratory. For serological tests two samples of serum are required, one taken in the acute stage and one 10-14 days or more from the onset of illness. Because it may be necessary to examine for more than one serum antibody it is customary to send 5-10 ml of blood.

Virus Isolation

Isolation of influenza virus is made from pharyngeal washings or, more conveniently, from throat swabs taken at the onset of illness, or from the lungs in fatal cases. The virus soon becomes inactive at temperatures above 4°C. so that specimens must reach the laboratory quickly. Whenever possible, material for virus isolation is sent packed in ice or "dry" ice (CO₂ snow), or Thermos jars. In the laboratory isolation is effected by inoculation of the developing hen's egg. A result is available in 5 to 10 days, depending on the number of passages required.

It will be apparent that laboratory aids to the diagnosis of influenza will not be of immediate help in the diagnosis of acute respiratory diseases. The practitioner must, therefore, continue to rely on his clinical acumen. On the other hand virological studies of selected cases proved of the utmost value in confirming the epidemiological evidence that a new type of influenza A virus had been introduced by a series of importations from the Far East and elsewhere and subsequently disseminated throughout the country. The places from which such infection was imported, the groups of persons concerned, and their mode of travel to this country, have already been described, as have the earlier stages of spread of influenza from these numerous separate foci so long as the paths remained traceable.

During 1957, a sufficient number of specimens were submitted to the laboratories for the isolation of respiratory viruses to make it reasonably certain that there was no influenza due to the Asian strain present in this country before mid-June, 1957.

Total Isolation of Virus A2

Commencing with the first reported isolations of the Virus A2 strain from specimens taken in London on 17th June, the new type was isolated from 635 specimens during 1957 and from 214 specimens during 1958, up to the end of June (being the period covered by this report), in all, 849 isolations.

Serological evidence of A infections

Serological evidence of infection with influenza A2 virus during the same period was found chiefly by the complement-fixation test in 3,660 specimens during the second half of 1957, and in 1,000 specimens during the first half of 1958, in all, in 4,660 specimens. A proportion of the sera were further examined to determine the type of A virus responsible, and where this was done the infection was invariably due to the A2 strain.

Other strains of influenza virus and of adenovirus

In the first quarter of 1957, that is well before the onset of the epidemic, a small number of strains of Virus A of the "Dutch 56" Type were isolated and during that year virological evidence of a few cases being due to Virus B and Virus C was obtained. Adenoviruses were also identified in connection with some outbreaks of acute respiratory disease occurring at that time.

The virological investigations which the Public Health Laboratory Service made possible over the greater part of the country, together with other observations, gave a good picture of the spread of the epidemic. The large scale on which these examinations were undertaken was made possible by advance information of the approach of the pandemic to this country and detailed anticipatory planning.

Bacteriological studies

Extensive bacteriological studies were made on material submitted from patients suffering from proven Asian influenza and from other influenza-like illnesses. The rapidity with which bacteriological results can be made available meant that many of these examinations were done with a view to immediate diagnosis of the primary disease. Others were made to determine the presence and nature of secondary bacterial invaders, and the amenability of these to antibiotic therapy. Examinations other than those made for reasons of diagnosis or guidance in therapy formed part of a detailed study to determine, if possible, matters which have long been in debate, for instance, the true role of *Haemophilus influenzae* in the causation of influenza, the place of other bacteria as secondary invaders, the possibility that certain bacteria or even particular strains of certain bacteria were associated with graver complications. In many cases these formed companion studies to the virological investigations. A combined study of the virological and bacteriological findings in deaths from Asian influenza made by hospital pathologists and the Public Health Laboratory Service throughout the country gave valuable results.

VII

POST-MORTEM BACTERIOLOGY AND MORBID ANATOMY OF THE EPIDEMIC

The full report by the Public Health Laboratory Service (1958) has been published of the collective study of 477 fatal cases of influenza undertaken by over one hundred hospital and 24 public health laboratory pathologists, the detailed analysis of individual reports being carried out at the Central Public Health Laboratory, Colindale, London.

This was the first occasion on which an investigation of such magnitude had been made. Covering as it did all parts of England and Wales it can be accepted as fairly representative geographically but less so from the point of view of age distribution.

Bacteriology at Post-mortem

It will be convenient to consider first the results of the bacteriological studies. In almost all cases these were made on specimens taken post mortem. The bacterial flora of lung or sputum was examined in 467 cases. The influenza virus was sought for in 310 of these cases and was isolated from 195 of them.

The results of the investigation are summarised in the table below:

Bacterial Flora of Lung or Sputum

Bacterial Flora	All Cases		Cases from which Influenza Virus was isolated	
	Number	Percentage of Total	Number	Percentage of Total
Staph. aureus alone	217	46.6	97	50.3
Staph. aureus + non-pathogenic bacteria	34	7.3	15	7.8
Staph. aureus + haemolytic streptococci	15	3.2	6	3.1
Staph. aureus + haemolytic streptococci + pneumococci	1	0.2	0	—
Staph. aureus + H. influenzae	15	3.2	7	3.6
Staph. aureus + H. influenzae + pneumococci	1	0.2	0	—
Staph. aureus + pneumococci	4	0.9	1	0.5
Staph. aureus + pneumococci + H. influenzae + haemolytic streptococci	1	0.2	0	—
Total with Staph. aureus	288	61.8	126	65.3
H. influenzae alone	7	1.5	5	2.6
H. influenzae + non-pathogenic bacteria	3	0.6	1	0.5
H. influenzae + pneumococci	1	0.2	0	—
Haemolytic streptococci (group A, C, or G) alone	3	0.6	0	—
Haemolytic streptococci + H. influenzae	2	0.4	1	0.5
Haemolytic streptococci + non-pathogenic bacteria	1	0.2	1	0.5
Pneumococci alone	16	3.4	11	5.7
Pneumococci + non-pathogenic bacteria	4	0.9	1	0.5
Total with other pathogenic bacteria ...	37	7.9	20	10.3
Non-pathogenic bacteria only	101	21.6	32	16.5
Sterile	41	8.8	15	7.8
Total non-pathogenic bacteria or sterile	142	30.4	47	24.3
Total Number examined bacteriologically	467		193	

Of the total number of specimens 8.8 per cent. were bacteriologically sterile and 21.6 per cent. contained non-pathogenic bacteria only. The proportions were similar in specimens from which influenza virus was isolated. Those in which there was no evidence of secondary pathogenic infection were not evenly distributed among the age groups but were drawn disproportionately from the extremes of life, or from those in the active years (15-44) with some pre-existent chronic disease. Thus, of 10 patients with rheumatic heart disease, nine were aged between 15 and 44 years, and seven yielded no bacterial pathogens in lung or sputum.

It would appear therefore that in infants, the aged and the infirm influenza virus was of itself sufficient to cause death.

At other ages some additional bacterial infection was usually found in fatal cases. Of all such pathogenic bacteria, *Staphylococcus aureus* was by far the most common. In the 467 deaths studied, it was found in 288. Moreover, it was the sole pathogenic bacterium in 251 cases. Excluding the 142 cases where no bacterial pathogen was detected, staphylococci were isolated from 88 per cent. of the remainder, their growth being frequently recorded as abundant.

Of other pathogenic bacteria, none was exclusively associated with influenza deaths. *Haemophilus influenzae* was found alone in seven and with other bacteria in 23 cases; pneumococci were present in 28 and haemolytic streptococci in 23.

The proportion of deaths associated with and probably attributable to staphylococcal infection varied with age. Staphylococci were found in 49 per cent. of specimens from fatalities under five years of age, in 88 per cent. of fatal cases in school children and in 73 per cent. of those in younger adults. After the age of 44, the proportion of cases shewing staphylococci fell; to 49 per cent. for older adults and to 31 per cent. for those over 64.

Morbid anatomy

Records of the findings at necropsy were available in 219 cases.

Post-Mortem Findings in Relation to Virus Isolation

Post-mortem Lesions	Cases with Specified Lesion as Percentage of all Examined	
	All Patients	Patients Yielding Influenza Virus
Pneumonia	85	85
Tracheobronchitis	53	63
Haemorrhage in lung or haemorrhagic pneumonia ...	31	36
Haemorrhage in adrenal	4	4
Haemorrhage elsewhere	6	4
Abscess in lung	18	13
Abscess elsewhere	9	0
Pleural effusion	5	7
Pericarditis	3	2
Rheumatic heart disease	5	2
Other chronic heart disease	3	4
Chronic bronchitis or bronchiectasis	6	3
Number examined	219	89

Death was due to pneumonia in 85 per cent. Tracheal or tracheobronchial lesions, often purulent, were present in more than half, in one third the pulmonary lesions were haemorrhagic and obvious abscess was noted in nearly one-fifth (18 per cent.). Other observers have commented on the capacity of the influenza virus for attacking and eroding respiratory mucous membrane, thus paving the way for secondary bacterial invasion.

Adrenal haemorrhage was noted in eight fatal cases—five of these patients were under four years of age and two were of school age.

Ten fatal cases had rheumatic heart disease (all mitral lesions) nine being in the age group 15–44 years. Other chronic cardiovascular disease was found in seven of the patients who died.

Chronic bronchitis or bronchiectasis was present at necropsy in 14 cases.

Twelve of 103 fatal cases in females aged 15–44 were pregnant which is about double the expected proportion in women in this age group. This reinforces the observation of Bashore and others that influenza can be a dangerous complication of pregnancy.

Influenza virus was isolated in 89 of the 219 fatal cases. The post mortem findings were similar to those of the whole series, and the appearances at necropsy were remarkably alike in all fatal cases irrespective of the bacteriological findings. Pneumonia was common in all bacteriological groups, but less so in those without pathogenic bacteria (67 per cent.) than in those with (86 per cent.), while, as might be expected, lung abscess was rarely found except in the presence of staphylococcal infection. The only further association noted between lesion and pathogen was in eight cases of adrenal haemorrhage—in three, infection with *Haem. influenzae* was found.

To summarize, the principal cause of death was pneumonia, and the pathogens mainly responsible were the staphylococcus and to a lesser extent the influenza virus itself.

The table below from Oswald, *et al* (1958) shows the principal pathogenic bacteria isolated from sputum. The authors express doubt whether *H. influenzae* should be regarded as a pathogen in the present context. In the non-staphylococcal group almost half yielded no pathogens, and a further 21 per cent. either had no sputum or examination was not performed. In the remainder the pneumococcus and *H. influenzae* occurred with equal frequency (16 and 17 per cent. respectively).

Principal Pathogenic Bacteria in Sputum (Oswald et al)

	Cases	Organisms*						Not Tested
		<i>Staph. aureus</i>	<i>Str. pneumoniae</i>	<i>Strep. pyogenes</i>	<i>H. influenzae</i>	<i>Kleb. friedlanderi</i>	Non-pathogens	
Staphylococcal pneumonia...	155	151	7	—	6	—	—	4
Non-staphylococcal pneumonia ...	145	—	24	2	23	2	74	30

* More than one organism was cultured from several cases in both series. Of the four cases in the first series in which the sputum was not tested the diagnosis was made in one from a blood culture and in three at necropsy.

The number of patients treated with the various antibacterial drugs is shown in the next table.

Number of Patients treated with Various Drugs

	Number of Patients Treated	
	Non-staphylococcal	Staphylococcal
Sulphonamides	16	12
Penicillin	108	118
Tetracycline	47	76
Chloramphenicol	13	25
Streptomycin	20	37
Erythromycin	2	39
Novobiocin	—	3

In the staphylococcal infections, penicillin (76 per cent.) and the tetracyclines (49 per cent.) were the drugs of first choice, but erythromycin, streptomycin and chloramphenicol were widely used as well; many received more than one antibiotic—only 28 per cent. were given a single drug.

In non-staphylococcal infections, 60 per cent. had only one antibacterial drug. Again, penicillin (74 per cent.) or the tetracyclines (32 per cent.) were the first choice, and were usually sufficient in illnesses which were mild or moderate. Other remedies were reserved for severer infections.

The final table of antibiotic sensitivities of staphylococci isolated shows the reason for the wide range and frequent change of drugs employed, and affords some measure of the risk to the influenzal patient of acquiring a secondary and often an antibiotic-resistant staphylococcal infection.

The proportion (49 per cent.) of penicillin-resistant strains found in those presumed infected outside hospital is greater than that reported by the Public Health Laboratory Service (approximately 35 per cent.). In those with possible or probable hospital infections, resistance to the more commonly used antibiotics was frequently met and presented a therapeutic problem. In all groups, resistance to the less widely used erythromycin and chloramphenicol was, by comparison, infrequent.

Sensitivities of Staphylococci Isolated from Patients with Staphylococcal Pneumonia following Influenza

	(a) Isolated within 4 days of Admission			(b) Isolated more than 4 days after Admission		(c) Influenza Contracted in Hospital		Per cent. Resistant (b + c)
	Number	Resistant	Per cent.	Number	Resistant	Number	Resistant	
Sulphonamides ...	34	15	44	5	4	1	0	67
Penicillin ...	113	55	49	18	16	9	9	93
Streptomycin ...	89	11	12	17	9	7	6	62
Tetracycline ...	94	21	22	18	12	9	8	74
Chloramphenicol	96	6	6	16	1	7	1	9
Erythromycin ...	60	4	7	17	1	8	0	4

VIII

INFLUENZA IN SPECIAL GROUPS

A. Influenza in the Royal Air Force

A study of the incidence of influenza in this Service was made by Holland, McDonald and Wilson between May, 1957 and the end of April, 1958. Three and a half months of this lengthy period of observation were to pass before the first authentic case of influenza A Asian occurred, during which time a miscellany of small outbreaks and sporadic cases of upper respiratory infections came to notice and were the subject of biological investigations. Without this, these incidents might well have passed for influenza, in which circumstances it might have been argued that the seeds of the epidemic had been here in the country the whole time. Two of the compilers of the report on the 1918-19 pandemic reached precisely this conclusion from similar observations of an accumulating number of small outbreaks of influenza-like illnesses which preceded that pandemic. Parsons in his earlier report mentions one localized outbreak in the north Midlands which preceded the pandemic of eighty years ago but stood by his opinion that the major epidemic was of foreign origin. Others of the older observers have recorded disturbances in the public health, some akin to a subsequent generalized outbreak and some not remotely resembling it. The purport of their comments was that disordered public health engendered epidemics. It is refreshing to find that at last this matter has been examined scientifically. In nine small outbreaks of acute respiratory disease at Royal Air Force stations between May and August, 1957 Holland, and his co-workers failed to find evidence of an influenzal cause; one outbreak was due to adenovirus type 3 and in eight no aetiological agent was discovered. There were, in addition, at recruit stations sporadic cases of Sendai virus infection, influenza C and psittacosis.

The first case of influenza A2 at Royal Air Force Stations in this country was detected on 15th August at a large recruit centre situated at West Kirby, Cheshire, which was the first unit to experience a large outbreak. The extent, date and duration of this outbreak and those at two other similar centres are shown in fig. 2.

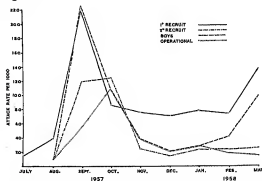


FIG. 2.—Acute respiratory disease attack rates in different types of station. (Holland, *et al.*)

West Kirby and Wilmslow, both in the county of Cheshire, had severe outbreaks in August and September. The record for the former ends with the closure of that centre in November. Bridgnorth, Shropshire, had a less severe outbreak in September and a second and more extensive outbreak late in November.

The epidemic affected primary recruit units and boys' units at much the same time.

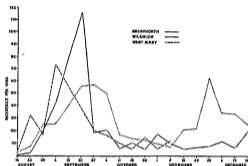


FIG. 3.—Incidence of acute respiratory disease at recruit camps, 1957. (Holland, *et al.*)

Secondary recruit units were involved a week later, and operational units two weeks later still. At operational stations there is more permanence of personnel than at recruit units, where there is constant change, and the average age is higher. After the main influenza outbreak had subsided in the operational stations no further outbreak occurred, although individual cases of influenza A arose. This was not so in the primary recruit units in which a high rate of respiratory illness continued until Easter. Not all of this was influenza: between December and the end of April 285 paired sera were examined, of which 54 showed a fourfold or greater rise in influenza A2 titre. During the same period 35 strains of the A2 variety were isolated, 28 from recruits and 7 from other stations. With few exceptions, the confirmed cases of influenza encountered in the first four months of 1958 were in patients who stated they had not been ill during the autumn epidemic.

The main weight of the epidemic fell in September and October, as is shown in the table below. (The column "estimated number of cases of influenza, 1957" is derived from the total of acute respiratory illnesses less those that might be expected in a non-influenza year).

Number of cases of influenza in the R.A.F., August-December, 1957

Month	Total number admitted or sick at home with respiratory disease, 1957	Corrected number of cases of respiratory disease, 1956	Estimated number of cases of influenza in 1957	Incidence
				per cent.
August	1,526	830	696	0.4
September	12,093	1,180	10,913	7.2
October	17,042	1,320	15,722	10.1
November	5,981	1,620	4,361	2.9
December	3,478	1,590	1,888	1.3

In all, some 22 per cent. of the Royal Air Force in this country fell sick with influenza.

The regional distribution of influenza was much as in the civilian population, the rates in London and South-eastern England being again noticeably lower than elsewhere.

Special study was made of influenza incidence in relation to type of station. The higher attack rate in recruit and boys' units has already been mentioned. At three operational stations attack rates were analysed in relation to immediate environment, comparing indoor with outdoor, small work place with large, ample with less commodious sleeping quarters and like observations. No association was found between these factors and the incidence of acute respiratory disease.

The only clearly discernible factor was the age of the patient. The incidence of acute respiratory disease fell with age: at 16-21 the attack rate was 36 per cent., at 22 to 30 it was 30 per cent. and at 31 and over, 19 per cent.

The opportunity was also taken at West Kirby to study the relationship between infection and clinical illness. Serological studies made on 387 patients admitted with acute respiratory disease showed that an influenza antibody titre of 1 in 8 or more was presumptive evidence of infection.

Sera from 121 of 128 airmen in a particular intake were examined after the peak of the epidemic had passed and before the men left the station. During the epidemic twenty-seven of the group had been in hospital with an acute respiratory disease of whom twenty showed a fourfold or greater rise in antibody titre to influenza A.

Of the 94 not admitted, from whom single sera were obtained, 38 had a titre of 1/8 or more, strongly suggestive of influenzal infection.

It would appear therefore that 48 per cent. of this intake became infected during their stay at this station, although only a third of those infected were ill enough to be admitted to hospital.

B. Influenza in schools

Of the total population nearly one-seventh attends day schools, forming a semi-closed community assembled in class by day, but otherwise dispersed. School children were caught up in the momentum of the epidemic and their experience was similar to that of the general population. In some instances the illness appeared in the community before the school opened, in others re-assembly seemed to have preceded the spread of infection in the community at large; in others again, and this was the more usual course of events, the two sections of the population were affected indiscriminately at about the same time.

There were variations in time of occurrence, incidence and severity in different parts of the country. Divergences were observed even between one school and another in the same locality, both in overall incidence and in the age-groups showing the highest attack rates.

It is not possible to state with any exactitude how many cases occurred, but as an estimate an overall attack rate of 50 per cent. would be not unjustified. Incidence among schoolchildren was usually measured by the number of absentees. For the most part, school attendance at the beginning of the Michaelmas term was better than average and in the region of 90-95 per cent. No other infectious disease was prevalent during the term and it is reasonable to ascribe to influenza any further fall in attendance. The estimates which follow are based on this assumption.

Day schools are open on five days a week during term. In 1957 most primary and secondary schools assembled in the first or second week of September after the summer holiday though there were certain exceptions, notably in East Lancashire and neighbouring parts of Yorkshire, where the summer holiday was taken in two parts.

In the northern half of England and Wales the peak of the epidemic was reached in most areas at the end of the third week in September. The day of highest absence from school was, in a number of instances, Friday, 20th September. Between one and three weeks' lag was observed before the epidemic developed in the southern half of the country, where in many places the maximum incidence was not until mid-October.

With its brief incubation period and short duration of illness, influenza developed swiftly in the schools. Even in those schools which were severely disorganised attendance returned to normal within four weeks of the appearance of the first cases. Most of the children affected suffered an illness lasting no more than three or four days and the majority were back at school within a week.

Within the ten-year span of the school age-group the attack rate varied with age. In general, those children upwards of 11 years attending secondary schools were attacked in the greatest numbers, and were usually the first to be affected, although in some areas the outbreak appeared first in entrants.

In the closed communities of residential schools a high attack rate was the rule, frequently reaching 90 per cent. and often affecting the whole school within a fortnight.

In a number of instances small schools were temporarily closed for want of pupils or staff but in general schools remained opened throughout the epidemic. In a few areas they were closed for a short period when absences exceeded 20 per cent., or some other agreed figure, but the effect of this procedure on the course of the epidemic is difficult to determine.

C. Influenza in the Insured Population

Through the courtesy of the Ministry of Pensions and National Insurance the information from which this section is derived was made available to this Ministry from week to week during the course of the epidemic.

Past experience has shown that sudden increases in first claims to sickness benefit are almost invariably due to influenza. So much is this so that arrangements are made whereby local insurance offices notify the Medical Officer of Health when the number of new claims for sickness benefit during the winter months exceeds by a set ratio the average weekly number received over the previous nine months from April to December. Though this scrutiny of claims usually takes place only in the winter it may be instituted at any time and on this occasion, in anticipation of an epidemic, it was begun in August. The yardstick was the average intake of claims in the period April to December, 1956.

Approximately 17½ million of the 29 million persons aged 15 and under 65 years of age are insured under the National Insurance Act and are entitled to sickness benefit. Though this large group of insured persons excludes, *inter alia*, children, old persons and most married women, who are not entitled to benefit, the behaviour of influenza in the insured population corresponds closely with its behaviour in the population as a whole. Consequently, the

number of persons claiming sickness benefit when influenza is present constitutes a rough index of the occurrence and prevalence of influenza in the general population. In Chapter 2 use has been made of this in tracing the sequence of events leading to epidemic occurrence.

Applications for sickness benefit began to rise during the week ended 27th August, 1957. Succeeding weeks saw an acceleration in the rate of rise of new claims until the peak of 471,000 was reached during the week ended 8th October. Thereafter the fall was rapid to begin with. The situation is shown graphically in the following chart. (It will be noted that this and other charts relate to Great Britain as a whole).

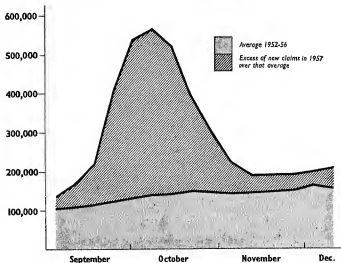


FIG. 4.—Number of new claims received in each week in the period 28th August to 10th December, 1957. (Ministry of Pensions and National Insurance).

In terms of claimants, there was in England and Wales between 21st August and 31st December, 1957, a total of some 4·5 million claims, being some 2 million in excess of the average for the preceding five years, the majority of which arose before the end of October. It is estimated by the Ministry concerned that one person in eight of those insured may have been incapacitated by influenza.

The approximate numbers drawing benefit at any one time can be estimated from the numbers of first medical certificates received in the course of a week from those falling sick, together with the numbers of intermediate certificates (from those still sick) and an allowance for the long-term sick not needing weekly certificates. The number of persons drawing benefit each week estimated on this basis is shown in Fig. 5 below, together with the excess intake of claims. The relationship between these weekly figures suggests that the majority of influenza claims lasted between one and two weeks.

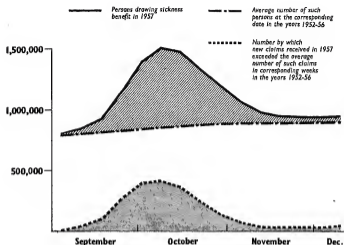


FIG. 5.—Increase in the number of persons drawing benefit compared with increase in the numbers making new claims, 28th August—10th December, 1957. Ministry of Pensions and National Insurance.

Fig. 6 shows the distribution of claims from the first sign of the epidemic to the end of the year compared with the average intake, the regions being arranged in descending order of average intake of claims.

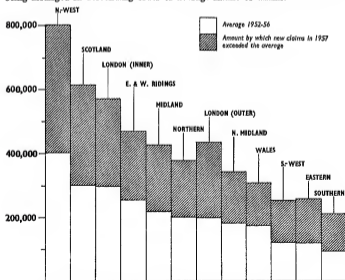


FIG. 6.—Intake of new claims in each region between 21st August and 31st December, 1957. (Ministry of Pensions and National Insurance).

Commenting on this, the Ministry of Pensions and National Insurance remarks that the epidemic came first in the north of England but lasted longer in the home counties and the eastern region. The largest number of new claims was received in the heavily populated areas of North West England, but it was the South that experienced the greatest proportionate excess; outer London, the eastern, southern and south-west regions were especially heavily affected, but except in the south-west pressure was spread over a longer time.

Effect on Industry

With an eighth of the insured population incapacitated at some time during the period of the epidemic, it is of some interest to examine the effect on industry. In reports to this Department, many medical officers of health made reference to this matter, but more often than not it was a local undertaking which had been severely affected. A recital of only the more notable items would thus give a misleading impression. More representative are the studies made in one large city as a whole by Semple at Liverpool and, for one industry, coal mining, in the South West.

Professor Semple and his colleagues found that among 12,500 employed in three large enterprises (the corporation's transport system, a football pool promoter's office and a large factory) the percentage absent rose from 8.2 on 16th September to 14.9 on 28th of that month, remaining around this level until 12th October and declining to 8.2 once more on 22nd October. The period covered by the observations corresponded to that of the worst of the outbreak, which began in Liverpool early in September and subsided by the end of October. Of the groups studied, those in the transport department were mainly men, the second mainly women and the third included both men and women.

The table following (published by permission of the Ministry of Fuel and Power) clearly shows the effect of influenza on capacity for work. The area covered includes South Wales, the Forest of Dean and the Bristol and Somerset coalfield.

From these analyses, and from the appreciation of the general position in local industry included by so many medical officers of health in their reports and the special references made to undertakings severely affected, it may be said that the industrial services and daily life of the country were maintained, and well maintained, despite the incursion made by the epidemic. So far as this was measurable it appears to have caused the absence at different stages and places of, in general, one-eighth of those engaged in industry, with even higher rates in some sorely tried establishments.

D. Influenza and the Family

In the course of their review of influenza in a general practice of just over 2,000 patients, Woodall, Rowson and McDonald noted that the highest attack rate was in children aged 5 to 14 years. This observation led to the investigation of the possibility of families with children attending school suffering more than those which had not. Scrutiny of the data revealed that this was so; the epidemic in this particular practice being almost confined to schoolchildren and their families.

Secondary attack rates, defined as attack rates among the remainder of the family after exclusion of the first case, for all age groups under forty years were similar, ranging between 48 and 60 per cent.; over forty years the percentage

The trend of absence increase mainly due to the influenza epidemic over a six weeks period

Area	Percentage Absence—Week ending						Change over corresponding week in 1956						Average
	31st August	7th Sept.	14th Sept.	21st Sept.	28th Sept.	5th Oct.							
	1	2	3	4	5	6	1	2	3	4	5	6	
1 ...	12.12	12.98	14.99	20.30	22.65	19.52	- 0.19	+ 1.01	+ 2.5	+ 8.12	+ 9.68	+ 6.35	4.58
2 ...	12.56	12.84	15.93	20.81	22.72	18.91	+ 0.62	+ 0.78	+ 3.6	+ 7.81	+ 9.42	+ 6.33	4.76
3 ...	13.68	15.23	15.73	18.48	26.28	25.63	+ 1.45	+ 2.58	+ 2.14	+ 5.11	+ 11.67	+ 11.85	5.80
4 ...	15.30	16.43	16.94	21.75	26.43	25.14	+ 1.07	- 0.64	+ 0.97	+ 5.72	+ 10.21	+ 9.66	4.43
5 ...	14.36	17.38	17.59	23.12	23.66	21.08	+ 1.36	+ 4.07	+ 3.71	+ 9.09	+ 8.53	+ 6.60	5.56
6 ...	13.11	15.06	15.79	19.78	22.23	20.34	+ 0.65	+ 2.12	+ 2.62	+ 6.18	+ 8.05	+ 6.31	4.32
9 ...	12.58	13.69	16.21	21.83	25.68	21.46	+ 0.84	+ 1.85	+ 3.2	+ 8.20	+ 11.5	+ 8.52	5.68
F/D ...	9.69	9.02	9.72	11.66	14.04	19.14	- 0.99	- 2.96	- 1.77	+ 0.83	+ 2.81	+ 8.05	
B/S ...	9.0	9.28	9.51	11.64	13.47	14.36	+ 0.23	- 0.32	- 0.13	+ 0.72	+ 2.58	+ 4.24	
Div. ...	13.30	14.74	15.91	20.39	23.65	21.56	+ 0.86	+ 1.65	+ 2.5	+ 6.74	+ 9.35	+ 7.85	

F/D — Forest of Dean Group.

B/S — Bristol and Somerset Group.

attacked fell to 37 per cent. of persons of 40 years but under 50 years, and 19 per cent. of those of 50 years and over. The lower rates in the senior members of the family could be explained either by lower susceptibility or by less exposure to infection. The primary cases in family outbreaks were most frequently in schoolchildren aged 5-14 years and least frequently in children under five. The subsequent order of becoming ill also varied with age, those over 40 seldom being infected next, but most often being third or later. The authors consider that this suggests that older persons may have been less exposed to infection from the younger ones who introduced it to the family than were infants and young adults.

The serial intervals between dates of onset in family outbreaks showed a periodicity of about two days, which agrees with other estimates of the incubation period of the disease.

E. Effect of Influenza on General Practice

During the course of the epidemic inquiry as to its extent and character was made of general practitioners in all parts of the country. In the main, these inquiries were as to the symptoms and severity of illness, the persons most affected and the ability of practitioners to meet the heavy and continued demands on their services—rather than the numbers treated.

A selection of representative examples may be given:

In South Yorkshire a partnership with a list of about 14,000 patients saw 150 fresh cases of influenza a day at the worst of the outbreak, later falling to 50 a day. Elsewhere, in this area, of a practice list of 8,500 270 fell ill with influenza in one week, and in a practice of 7,000 influenza attacked 30 a day at the time of the report. Near by, two partners saw 375 cases of influenza in a fortnight of their list of 6,000.

In the Birmingham area a partnership with 6,000 patients stated that some 50 fresh cases of influenza were seen each day for two weeks.

In a south-eastern suburb of London one practitioner recorded his visits and consultations. Between 20th September and 4th October he paid 192 visits. 572 patients attended his surgery. It was not possible to record those who had influenza, but compared with the corresponding period of the previous year there were an extra 123 visits and 93 consultations which could reasonably be regarded as some measure of the outbreak.

In towns on the Hampshire-Surrey border one doctor estimated that some 40 per cent. of 3,000 patients was treated for influenza, another with 1,700 patients considered that 60 per cent. of patients came under attention, and a partnership with 10,000 patients stated that the epidemic lasted a month and during the worst period influenza accounted for 80-100 cases a day.

In rural Kent, at the time of his report a doctor with a list of 3,000 was seeing some 10 new cases of influenza a day.

These and the many similar reports from all parts of England show that for upwards of a month general practitioners were exceptionally busy.

In Wales an assessment of the situation in general practice was made, county by county, by the medical staff of the Welsh Board of Health. In the west, crowded surgeries and trebled visiting lists allowed little opportunity for routine re-visiting which was reserved for those seriously ill. It was estimated that the

number of patients seen was no more than half of those affected, for in many instances one of a family would attend asking advice for the treatment of several members of the household without requesting a visit. In rural areas many obtained advice by telephone, or relied on that given in broadcasts and in the press. No serious complications appear to have arisen from the inability of doctors to follow up cases in the customary way.

In the industrial parts of Glamorgan and Monmouth the main pressure was on the surgeries. In one partnership one doctor remained all day in the consulting room seeing ambulant patients while the other was engaged in continuous visiting. Again, re-visiting was selective.

In a practice in Barry with a list of 8,000 patients, total visits by three partners for respiratory conditions reached 580 during the week commencing (Monday), 30th September, 470 being new visits, compared with a weekly range during the year of 30-150 total visits and 60-140 new visits; visits for all conditions during the year varied between 160 and 330 weekly, but reached 606 during the same week.

Elsewhere, in the industrial parts of North Wales the position was similar to that in the South.

In rural counties generally the greatest cause of concern was the difficulty in securing a locum tenens when practitioners themselves fell ill. The conditions of urban practice allow one doctor to assist another during times of emergency or personal incapacity but in areas served by sparsely distributed practitioners working alone, such mutual support is not possible.

From the time when influenza became generally epidemic it was clear that practitioners would be under great pressure as long as the outbreak lasted and in late September an approach was made by the Ministry of Health to Medical Officers of local health authorities, to hospital authorities and to local medical committees inviting their joint consideration of ways of mobilising, conserving and reinforcing medical manpower. Among measures suggested were the establishment of a county or regional pool of locum tenentes, a direct approach to retired doctors known to be living in the area, the loan of junior hospital medical staff as part-time assistants and of local authority medical officers for evening and week-end duty. This last proved to be the most effective and in a number of parts of the country public health medical staff made valuable digressions into general practice.

INFLUENZA IN PRACTITIONERS

As the preceding paragraphs suggest, doctors were themselves no more immune to influenza than were their patients. A study of the incidence of the disease in practitioners has been published by the College of General Practitioners.

Of 66 doctors who took part in an inquiry undertaken by the Epidemic Observation Unit of the College, 19 had an attack of influenza during the epidemic. Fourteen were incapacitated for some time; 13 had been in daily contact with influenza for three to nine weeks before they fell ill.

Among 22 who did not have a clinical attack of influenza, 17 still showed a complement fixation titre of 1 in 8 or less at the end of the epidemic and 5 had titres of 1 in 16 or higher.

PREScriptions ISSUED DURING THE EPIDEMIC

Consideration of the number of prescriptions issued during the epidemic throws little light on the question of the total number of persons treated by general practitioners. During the three months before the outbreak (June, July and August) 44½ million prescriptions were dispensed and 51 million in the corresponding months of 1956. During September–December, 1957 the total was 76½ million, with 74½ million in the same months of 1956.

In September and October, the months of greatest prevalence of influenza, 3½ million more prescriptions were dispensed than in the corresponding two months of 1956. On the other hand, there was a fall by the like amount in November and an increase of 2½ million in December, in both of which months influenza was still markedly prevalent.

Study of the drugs prescribed suggests that in the main simple antipyretics and linctuses sufficed for treatment of the patient in his own home, with selective rather than general use of antibiotics.

After the main impetus of the outbreak had spent itself, there remained a raised level of influenza in the country, clearly identifiable by the laboratory but merging clinically with other forms of winter respiratory disease. Some saw in this continuance the beginnings in this country of the second wave reported in certain countries abroad, others regarded it as no more than the inevitable aftermath. Except in November there was in each month from September, 1957 to the end of April, 1958 a substantial increase in prescriptions dispensed compared with the corresponding month of the preceding year. During these months the continuance of the epidemic was clearly discernible even if largely unrecorded at the time.

In retrospect, then, the influenza epidemic of 1957–58 was for the practitioner a month or more of sustained extreme demand during the autumn followed by a winter of increased work to which influenza still made a substantial contribution.

ANCILLARY SERVICES OF LOCAL HEALTH AUTHORITIES

Home Nursing

Of the health services provided by counties and county boroughs, three were in especial demand during the autumn epidemic. Long established and well known by doctor and patient, the home nurse (still better known to many by the older name district nurse) both shared with the practitioner the treatment of the seriously ill in their homes and materially reduced the size of his visiting list by a judicious sifting of potential calls.

There are in England and Wales a little over 10,000 home nurses, of whom approximately one half practice also as midwives or health visitors. In 1957 some 25 million visits were made to a little over one million patients. Of these nearly 19 million visits were designated medical and were in respect of some 750 thousand patients.

In 1956 slightly fewer total visits were made to substantially the same number of patients, 16½ million being medical visits to some 700,000 patients.

There were therefore some 50,000 added medical patients who occasioned little short of 2½ million visits, and it may not be unreasonable to regard much of this increase as of influenzal origin.

Health visiting

The part played by health visitors is not so readily shown arithmetically. The number of visitors was much the same in 1957 as in 1956—around 6,300—and the average number of visits made by each remained constant at some 11,000 in the year. It was rather by a re-arrangement of their work and local deployment of their strength that health visitors found opportunity to assist.

Of the part played by home nurses and health visitors, the observations of one Medical Officer of Health (J. L. Burn, Salford, personal communication) may be regarded as representative—(both) “aided the practitioner greatly in reducing the number of calls and in selecting those requiring visiting”.

Home helps

When doctor and nurse have departed there must still remain someone in the home to care for the patient confined to bed. Where relatives cannot undertake this local authorities provide help in the home. Demands for this service have increased progressively and the total strength of some 3,000 whole-time and 38,750 part-time workers is permanently occupied. Again, comparison of one year with another does not necessarily show the effect of the epidemic, but the 258,469 cases attended in 1957 were 20,808 more than in 1956. Of these 71 per cent. were elderly or chronic sick.

F. Influenza and the Hospital Services

Influenza in Hospital Staff

Of those working in hospital nurses and those whose duties brought them into contact with infection were at greater risk and suffered more than those whose duties lay elsewhere.

Reports from two areas may be regarded as representative of what was happening generally.

That from Liverpool (Dr. Lloyd Hughes, Senior Administrative Medical Officer, personal communication) relates to nurses and covers the five weeks during which the epidemic was at its worst. In 15 larger hospitals providing 3,344 beds, there were absent on 23rd September 12·6 per cent. of nursing staff, and weekly during the succeeding four weeks 17·5, 19·4, 14·8 and 10·7 per cent. On 7th October nearly one nurse in five was ill—at one hospital two in five were away, at another nearly one third.

The reports from the Senior Administrative Medical Officer, North West Metropolitan Region cover the period from the week ended 28th September to that ended 23rd November and relate to all hospital staff among whom the cases of influenza were 531, 1,057, 1,428, 1,277, 946, 502, 283, 173 and 142 in the respective weeks.

As will be seen, the epidemic made most serious inroads on those themselves engaged in treating the gravely ill. As with the general medical service, those in less urgent need stood aside—admission from waiting lists was suspended where the position so dictated. Visiting of patients was similarly greatly curtailed or suspended for a time both to limit the introduction of infection from without and to reduce work within. By these simple and clear-cut (if somewhat drastic) measures the work of the hospitals was continued.

Emergency Bed Bureaux

It will be inferred from the foregoing that practitioners having occasion to send patients into hospital might find some difficulty, not so much in ultimately

securing admission as in arranging for a bed at the hospital of first choice. Much of this labour is now transferred from the practitioner to the bed bureau in London, Birmingham, Sheffield and Liverpool, from all of which detailed reports have been made available of the working of this service during the epidemic. That from the Emergency Bed Service, London (provided through the courtesy of the Secretary, Commander J. R. E. Langworthy) may be given as typical.

"The effect of the epidemic became noticeable in the latter part of September when requests for beds for patients with respiratory disease became considerably more numerous than is normal at this season, but it was not until October that the full effect of influenza was felt.

During that month 6,408 applications were received compared with the normal 4,000 of which 2,477 were on account of respiratory disease. The peak was during the second week of October, at which time requests for beds were of an order usually found only in January, the busiest month of the year. During the latter part of October applications fell quickly and by early November were once more at their customary level."

The accompanying graph demonstrates admissions (shown by age groups) effected by the London Emergency Bed Service throughout the autumn and winter of 1957-58. The duration, magnitude and ages affected are clearly apparent.

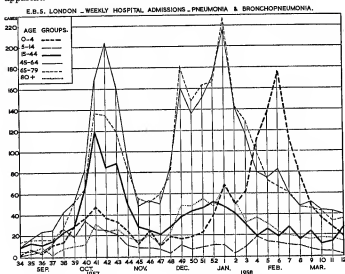


FIG. 7.

In general terms it can be said that the epidemic added notably to the normal work of the several health services but did not tax these beyond what all have long been accustomed to meet during each winter. The initial violent strain was followed by a somewhat higher demand than is usual in late autumn to merge with the inescapable winter rise in respiratory illnesses.

IX

VACCINATION AGAINST INFLUENZA A2 VIRUS

The early warning received of the impending arrival of the Asian strain in this country made it possible to attempt to provide a specific vaccine with some prospect of success.

The first requirement was a serological trial to establish the minimum antigenic potency needed for the vaccine to give an adequate antibody response. The second was to test the protective action of the vaccine by field trials.

Both the serological and the field trials were undertaken by the Medical Research Council's Committee on Influenza and Other Respiratory Virus Vaccines on whose "Fourth Progress Report" the notes which follow are based. The vaccines mentioned were prepared by Dr. F. Himmelweit of the Wright-Fleming Institute of Microbiology.

For the serological trial four saline vaccines were prepared from an egg-adapted line of the Asian strain A/Singapore/1/57, i.e. a vaccine of 20,000 haemagglutinating units (H.U.) per dose and three dilutions of this vaccine containing, respectively, about 14,000, 7,000 and 3,500 H.U. per dose.

In each vaccine the virus was adsorbed on to 10 mg. aluminium phosphate per dose of 1 ml. The vaccines were administered by deep subcutaneous inoculation into the upper arm.

Volunteers for the trial were obtained at the Royal Army Medical Corps Field Training Centre, Mytchett and from Royal Air Force stations at Lindholme, Fittingley and Bawtry. These were divided into four sub-groups, each to receive one of the four vaccines. Specimens of serum were obtained from each volunteer prior to inoculation and three weeks later. The antibody responses are shown in the table below.

*Haemagglutination-inhibition Titres observed Three Weeks after Primary Inoculation with Asian Influenza Vaccine of Different Strengths**

Titre	Vaccine A 20,000 H.U. per Dose	Vaccine B 14,000 H.U. per Dose	Vaccine C 7,000 H.U. per Dose	Vaccine D 3,500 H.U. per Dose
10 or under	9	15	13	11
12.5-17.5... ..	9	8	6	6
20-50	13	3	6	8
60-120	3	2	4	—
Total	34	28	29	25
Geometric mean titre ...	14.9	7.6	9.8	7.2

* The H.I. titres prior to inoculation were in all cases less than 5.

It will be observed that the antibody responses were, in general, low, and it was accordingly decided to carry the trial a stage further and investigate the serological response to a second dose given three to four weeks after the first. This was done in all volunteers remaining in the sub-groups originally given full and one-third strength vaccines (A and C of the tables). Serological studies of further specimens taken about three weeks after the second dose showed a

marked rise in titre, the increase being much the same for both vaccines. The results of this further study are given in the table below.

Haemagglutination-inhibition Titres observed about Three Weeks after First and Second Doses of Asian Influenza Vaccines, the Second Dose given Three to Four Weeks after the First

Titre	Vaccine A 20,000 H.U. per Dose		Vaccine C 7,000 H.U. per Dose	
	After First Dose	After Second Dose	After First Dose	After Second Dose
Under 20	13	—	16	1
20-50	7	5	3	8
60-120	—	13	2	11
121-240	—	2	—	1
Total	20	20	21	21
Geometric mean titre ...	8.8	77.7	4.2	56.5

The purpose of the field trials was to study the relative protective effects of a single dose of about 20,000 H.U. (vaccine A), a single dose of about 7,000 H.U. (vaccine C) and two doses each of about 7,000 H.U. (vaccine C). In addition, a polyvalent vaccine from older strains of influenza virus A was used to find whether this would exert a protective effect. A vaccine of the influenza B type was used as a control.

Volunteers for these trials were forthcoming in public schools, teachers training colleges, a Royal Naval dockyard, the public services, a northern university and a pharmaceutical company in the midlands.

Field trials organised by the Committee in previous years had proved inconclusive because of a low incidence of influenza. During the 1957 trials the incidence of influenza was high, but the epidemic period was unusually early in the season and, in most of the groups under investigation, influenza began before the inoculations had been completed.

The results of the field trials of 1957 had therefore to be considered in relation to the interval between the inoculation of volunteers and the development of the epidemic in each area. For each of the public schools this information is shown separately in the note accompanying the Table on the following page.

RESULTS OF FIELD TRIALS

A. Public Schools

The vaccines used at the public schools were (1) An Asian type saline vaccine from the strain A/Singapore/1/57, with 20,000 H.U. per dose of 1 ml and 10 mg. of aluminium phosphate, to be given in one dose. (2) A polyvalent saline influenza A vaccine containing equal proportions of Swine PR.8 and FM.1 with 20,000 H.U. per dose of 1 ml and 10 mg. of aluminium phosphate, to be given in one dose. (3) An influenza B vaccine (1954) with 20,000 H.U. per dose of 1 ml and 10 mg. of aluminium phosphate, to be given in one dose.

Analysis of the results of the trials showed that, in the first eight days after inoculation, there was little difference between the influenza attack rates in the

Vaccine	School	Number of Boys Inoculated	Number of Cases Occurring				Cases Expressed as a Percentage of those Inoculated in Each Vaccine Group			
			Days after Inoculation				Days after Inoculation			
			1-8	9-15	16 and over	Per cent.	1-8	9-15	16 and over	Per cent.
Asian	Canford School...	75	2	7	—	2.7	—	9.3	—	—
	Epsom College...	51	15	2	—	29.4	—	3.9	—	—
	Haileybury and L.S. College	139	23	10	2	16.5	—	7.2	1.4	—
	Marlborough College...	97	51	10	—	52.6	—	10.3	—	—
	St. Lawrence College...	42	4	4	3	9.5	—	9.5	7.1	—
	Trent College...	64	36	—	—	56.3	—	—	—	—
Total (excluding Trent College)		404	95	33	5	23.4	—	8.2	—	1.2
Polyvalent Virus A (Non-Asian)	Canford School...	70	3	19	5	4.3	—	27.1	7.1	—
	Epsom College...	62	16	17	1	25.8	—	27.4	1.6	—
	Haileybury and L.S. College	140	27	33	5	19.3	—	23.6	3.6	—
	Marlborough College...	103	48	25	—	46.6	—	24.3	—	—
	St. Lawrence College...	62	7	13	3	11.3	—	21.0	4.8	—
	Trent College...	71	52	2	—	73.2	—	2.8	—	—
Total (excluding Trent College)		437	101	107	14	23.1	—	24.5	—	3.2
Control Virus B	Canford School...	73	4	23	4	5.5	—	31.5	5.5	—
	Epsom College...	56	14	7	—	25.0	—	12.5	—	—
	Haileybury and L.S. College	143	18	43	5	12.6	—	30.1	3.5	—
	Marlborough College...	100	55	21	—	55.0	—	21.0	—	—
	St. Lawrence College...	57	3	12	7	5.3	—	21.1	12.3	—
	Trent College...	62	43	—	—	69.4	—	—	—	—
Total (excluding Trent College)		429	93	106	16	21.7	—	24.7	—	3.7

Canford School: Epidemic began 5th October, ended 19th October; whole school attack rate about 46 per cent. Inoculations 27th and 28th September with one or two boys a few days later.

Epsom College: Epidemic began 27th September, ended 13th October; whole school attack rate about 61 per cent. Inoculations 28th September.

Haileybury and L.S. College: Epidemic began about 21st September, ended 16th October; whole school attack rate about 44 per cent. Inoculations 23rd, 24th, 26th and 27th September.

Marlborough: Epidemic began 22nd September, ended 4th October; whole school attack rate about 80 per cent. Inoculations 27th September.

St. Lawrence College (senior school): Epidemic began 1st October, ended 23rd October; whole school attack rate about 42 per cent. Inoculations mainly 28th September and 1st October, but some 13th October. Through a clerical error, not affecting the random allocation, rather fewer boys were given the Asian vaccine.

Trent College: Epidemic began 25th September, ended 6th October; whole school attack rate about 79 per cent. Inoculations 27th and 28th September. Excluded from the total, since the epidemic was over within the eight days after inoculations.

three vaccinated groups. In five of the schools a total of 309 boys inoculated with the Asian vaccine, 336 inoculated with the Asian vaccine, 336 inoculated with the polyvalent virus A vaccine and 336 inoculated with the virus B vaccine were not attacked by influenza within eight days of their inoculation. The subsequent attack rates in these groups were 12 per cent., 36 per cent. and 36 per cent. respectively. The protection given by the Asian vaccine (20,000 H.U. per dose) appeared to have been of the order of 67 per cent. There was no evidence to suggest that protection was conferred by the polyvalent virus A vaccine.

V₃ Training Colleges

The interpretation of the results at the teachers training colleges was subject to the same considerations as at the schools; the epidemic began a little before (or in one college a day after) the first inoculations were given.

Teachers Training Colleges, Influenza Cases in Inoculated Students in Five Centres according to the Length of Time Elapsing after Inoculation

Vaccine	Number of Students Inoculated	Number of Cases Occurring			Cases Expressed as a Percentage of those Inoculated in Each Vaccine Group		
		Days After Inoculation			Days After Inoculation		
		1-8	9-15	16 and over	1-8	9-15	16 and over
Asian	216	32	4	2	14.8	1.9	0.9
Control virus B ...	102	12	8	4	11.8	7.8	3.9

The vaccines used at the teachers training colleges were (1) An Asian type saline vaccine from the strain A/Singapore/1/57 with approximately 7,000 H.U. per dose of 1 ml and 10 mg. of aluminium phosphate, to be given in two such doses, the second to be given 28 days after the first. (2) The same as (1) but limited to one dose only. (3) An influenza B Vaccine as in A (3) above.

In some of the colleges the epidemic had passed before the second inoculations were due, in others these were given during the epidemic. In effect volunteers receiving two doses were in no better immunological position than those receiving a single dose and both sub-groups were accordingly considered as forming one group.

Subsequent to the eighth day the influenza attack rate in those given Asian-strain vaccine (7,000 H.U. approximately per dose) was 2.8 per cent. compared with 11.7 per cent. in the control group receiving virus B vaccine—an apparent protection of 75 per cent.

Miscellaneous centres

What has been said of the training colleges applies equally to the miscellaneous centres. The same vaccines were used and the overlap between inoculations and the occurrence of influenza made it impracticable to measure the effect of the second dose of Asian-strain vaccine (7,000 H.U. approximately per dose).

Consequently, all given this vaccine, whether in one or two doses, were regarded as forming a single group. The 1,308 volunteers observed at the "miscellaneous" centres included office, factory, dockyard and university resident staff, students at a university and members of an ambulance service—a diverse group, in the main adults living in their homes, drawn from a number of fields. In all these centres influenza was prevalent at some stage subsequent to the inoculations. In this group records were kept of absences from work both on account of influenza and from other respiratory infections.

The results of this trial

Miscellaneous Centres. Absences from Work Reported as due to (a) Influenza; (b) Other Respiratory Infections in Seven Centres according to the length of time elapsing after inoculation

Vaccine	Number Inoculated	Number of Cases Occurring within Specified Intervals after Inoculation					
		1-8 Days		9-15 Days		16 Days and over	
		Number	Rate	Number	Rate	Number	Rate
(a) Influenza							
Asian	861	10	per cent. 1.2	9	per cent. 1.0	42	per cent. 4.9
Control virus B	447	2	0.4	4	0.9	46	10.3
(b) Other Respiratory Infections							
Asian	861	9	per cent. 1.0	5	per cent. 0.6	41	per cent. 4.8
Control virus B	447	2	0.4	2	0.4	27	6.0

indicated a 52 per cent. protection against influenza of those receiving the Asian-strain vaccine. The incidence of respiratory infections other than influenza was not significantly different between the two groups.

For the protection of priority groups the Ministry of Health arranged for the manufacture of an Asian-strain vaccine containing about 7,000 H.U. per dose. During October and November, 1957, the Wright Fleming Institute manufactured some 400,000 doses for distribution to hospitals through one of the pharmaceutical companies and another company prepared 200,000 doses. The whole of this supply was made available to the hospital service.

X

CONTROL OF INFLUENZA

From what has been written in this Report the idea of control of influenza may seem rather to be the expression of a hope than of a practical issue. But there are grounds for restrained optimism.

An important observation made by the Medical Research Council's Committee on the field trials which have just been reviewed in the preceding chapter was that relating to the protection provided by an A/Asian vaccine of suitable strength on young male volunteers. Eight days after vaccination, vaccinated groups showed significantly fewer cases of influenza than did control groups. This result was achieved while the epidemic was in progress, in spite of which a substantial degree of protection was attained, the protection ratios varying between 52 per cent. and 75 per cent. That vaccine may be used in the control of an outbreak already in progress is a new idea which is worthy of further consideration and investigation.

Further encouragement can be obtained by a study of the following chronological table of events relating to the spread of the A2/Asian virus in the first two phases of the pandemic.

Phase 1: Anticipation, 6th May, 1957 to 17th June, 1957

February	...	...	Drs. Tang and Chu, Peking, isolated the new variant
17th April	...	...	Report in the New York Times
6th May	...	...	First report to W.H.O. from Dr. Hale, Singapore
6th June	...	...	First report of importation to the United Kingdom

Vaccine Preliminaries

17th May	...	...	A2/Singapore/1/57 Virus reached the National Institute of Medical Research, London
24th May	...	...	Announcement of biological characters
28th May	...	...	Strains issued to manufacturers

Phase 2: Dissemination, 17th June, 1957 to 31st August, 1957

17th June	...	...	First proved outbreak in the United Kingdom 11/57 Pakistani naval ratings who arrived by air on 13th June
28th June	...	...	First proved indigenous case
July (early)	...	...	Outbreaks in troops and airmen
10th July	...	...	First outbreak in jamboree camps
15th July (onwards)	...	...	Several indigenous cases known
1-14th August	...	...	27 outbreaks reported from certain groups
21st August	...	...	First outbreak—Sheffield
24th August	...	...	Widespread outbreak in Schools—Colne

Vaccine Trials

25th July	...	...	Results (serology) 3 weeks after 1 inoculation
26th August	...	...	Results (serology) after 2 inoculations

Significant points in this chronology are as follows: The new variant was isolated in China in February, 1957, but it was not until 6th May that the first report reached the World Health Organization from Singapore. There was thus a delay of over two months between the first isolation of the virus and its notification to the World Health Organization. Twenty-two days after the notification of the strain of virus to the World Health Organization subcultures of the virus were being sent out to vaccine manufacturers in the United Kingdom. Manufacturers had then a month to produce the first batches of vaccine in commercial quantity before the first indigenous cases were reported.

Had the new strain been made available to the World Health Organization as soon as it had been identified in February, two months would have been gained. In this country, had subsequent events followed the above chronological sequence or something very close to it, the new virus could have been issued to vaccine manufacturers early in April, nearly a month before the first importation into the United Kingdom and over six weeks before the appearance of indigenous cases there.

These observations point to the strategy which might be adopted under the threat of invasion by a new influenza virus; namely, in the early stages to delay by all the reasonable measures available the spread of the infection for as long as possible so as to give time for the preparation of vaccines effective in its control. This can only be feasible if the new strain makes its appearance in a distant country. This involves—

- (a) obtaining as early warning as possible
- (b) preparing the appropriate vaccine
- (c) immunizing priority groups
- (d) the isolation, usually at home, of patients suffering from the disease
- (e) the issue to contacts of advice regarding their personal conduct aimed at delaying the spread of infection.

The priority groups for immunization comprise the key personnel of departments of security transport and health; hospital staffs and those engaged in essential occupations. Priority should also be given to those at special risk from complications, such as persons suffering from cardio-vascular disease, renal disease, disease of the lung and diabetes as well as to pregnant women who are known to be specially vulnerable to pulmonary complications.

As supplies of vaccine become more plentiful issue could be made on demand. In this country vaccine became available to patients under the National Health Service some months after the beginning of the epidemic and vaccine is still available as provision against future outbreaks due to the A/2 strain.

As a long-term policy there are the arrangements made by the World Health Organization for the continual surveillance of influenza throughout the world. A similar surveillance should be maintained in every country which has the means to carry it out, and so far as possible brought into the World Health Organization's programme.

The measures adopted in this country for the early reporting of winter epidemics may be put into action elsewhere. They are, briefly:

Arrangements made with selected general practitioners (influenza spotters) to report to the local Medical Officer of Health the first cases of influenza in their practice; arrangements made with local Registrars to draw the attention

of the appropriate Medical Officers of Health to excessive numbers of deaths ascribed to pneumonia, bronchitis or influenza and the arrangements whereby officers in charge of the local offices of the Ministry of Pensions and National Insurance inform Medical Officers of Health when the first claims for sickness show an increase of 30 per cent. above the figure for the preceding week or reach 250 per cent. of the average weekly number of new claims for the previous 35 weeks.

Under favourable circumstances there is thus the possibility of at least mitigating the disruptive effects of an influenza pandemic. This, in itself, would be a step forward in our control of the situation and augurs well for further progress directed at reducing the mortality from the disease.

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APPENDIX

TABLE A

*Deaths from All Causes, Influenza, Pneumonia and Bronchitis
by quarters (Persons)*

England and Wales—July, 1950–June, 1958

Year and Quarter	All causes	Influenza	Pneumonia	Bronchitis
1950				
September	102,871	102	2,214	2,872
December	135,348	690	4,694	8,715
1951				
March	205,838	14,993	11,986	22,315
June	121,683	388	4,037	5,869
September	99,960	96	2,414	2,728
December	121,899	332	4,059	6,073
1952				
March	146,947	853	6,819	10,423
June	115,366	334	3,710	4,616
September	98,612	71	2,363	2,483
December	136,559	492	5,716	9,746
1953				
March	171,351	5,646	10,421	17,188
June	114,642	470	3,791	4,702
September	98,544	60	2,251	2,530
December	118,992	289	4,296	5,972
1954				
March	153,120	708	7,258	11,505
June	117,205	180	3,668	4,817
September	104,114	72	2,575	3,013
December	127,457	851	4,578	6,208
1955				
March	168,647	2,183	8,968	13,442
June	124,230	479	4,476	6,028
September	101,676	45	2,660	2,635
December	124,311	276	4,890	6,688
1956				
March	170,292	2,104	10,358	15,274
June	120,059	203	4,302	5,174
September	104,131	65	2,848	2,946
December	126,849	254	4,863	6,276
1957				
March	134,557	357	6,159	8,262
June	118,122	131	4,271	4,753
September	110,037	998	3,655	3,361
December	152,154	5,230	8,719	10,559
1958				
March	163,595	1,892	9,762	13,261
June	124,168	226	5,029	5,557

APPENDIX

TABLE B

New claims to sickness benefit under the National Insurance Act
England and Wales—July, 1950 to June, 1958

Quarter	New claims to Sickness Benefit	Quarter	New claims to Sickness Benefit
1950			
September	1,162,100		
December	1,548,600		
1951		1955	
March	2,967,300	March	2,470,900
June	1,312,300	June	1,437,700
September	1,127,700	September	1,230,300
December	1,384,700	December	1,603,700
1952		1956	
*March	1,911,600	*March	2,612,000
June	1,277,300	June	1,426,900
September	1,211,400	September	1,260,200
December	1,607,000	December	1,610,500
1953		1957	
March	2,522,600	*March	2,045,600
June	1,342,500	June	1,440,600
September	1,170,500	September	1,647,200
December	1,560,000	December	3,542,900
1954		1958	
March	2,077,100	March	2,271,500
June	1,350,600	June	1,525,300
September	1,179,400		
December	1,748,900		

* Includes last week of previous quarter.

APPENDIX

TABLE C

Corrected notifications of pneumonia by quarters
England and Wales—July, 1950 to June, 1958

Year	Quarter			
	March	June	September	December
1950	—	—	3,303	6,930
1951	26,387	6,896	3,404	6,538
1952	12,786	6,617	3,327	8,981
1953	19,923	6,859	3,110	7,306
1954	10,328	5,525	3,315	7,374
1955	13,193	6,612	2,631	5,463
1956	12,754	5,201	2,600	4,877
1957	8,215	4,784	4,622	15,074
1958	10,717	4,476	—	—

TABLE D

*New Claims to Sickness Benefit under the National Insurance Act
England and Wales. Standard Regions. July, 1957 to June, 1958*

Week ended	Standard Regions									
	England and Wales	Northern	East and West Ridings	North Western	North Midland	Midland	Eastern	London and South Eastern		Wales
								London and Midlands	Remainder	South Western
1957										
July 2nd...	95,900	8,100	10,700	16,200	7,400	9,400	5,200	11,800	8,400	4,400
" 9th...	94,700	8,100	10,900	15,000	7,300	9,300	5,600	12,300	9,200	4,600
" 16th...	88,500	7,900	10,200	14,300	7,100	8,400	5,100	11,400	8,000	4,400
" 23rd...	87,600	7,900	10,000	15,000	7,100	8,500	4,900	10,900	7,900	4,200
" 30th...	88,800	8,100	10,600	15,200	6,900	8,500	4,700	11,100	7,800	4,100
Aug. 6th...	65,900	6,500	7,200	12,200	4,900	5,000	3,400	8,500	6,000	3,100
" 13th...	90,400	8,500	10,000	16,800	6,600	6,900	5,000	11,900	8,400	4,200
" 20th...	94,700	8,500	10,700	16,500	7,500	9,500	5,000	11,600	8,300	4,200
" 27th...	103,700	9,400	13,100	18,100	8,600	10,500	5,400	12,200	8,800	4,500
Sept. 3rd...	120,100	10,600	17,800	23,300	9,800	11,300	5,800	13,300	9,500	4,500
" 10th...	150,200	13,900	26,200	31,600	11,700	12,700	6,600	14,900	10,100	5,100
" 17th...	199,900	20,300	33,600	40,600	15,400	15,700	7,500	16,800	11,600	5,400
" 24th...	368,800	42,600	60,700	98,700	29,300	30,400	11,700	25,600	17,400	6,600
Oct. 1st...	452,300	51,700	58,900	110,800	39,800	45,600	18,000	36,600	25,300	10,500
" 8th...	471,000	46,900	43,600	91,600	40,400	55,300	25,800	50,600	39,100	12,800
" 15th...	451,700	33,600	31,100	62,800	34,800	49,700	31,900	65,500	54,800	18,800
" 22nd...	352,000	22,400	23,400	41,800	24,400	33,600	27,100	57,800	48,500	26,300
" 29th...	269,900	16,700	20,000	32,100	18,400	23,800	21,200	45,200	37,400	24,700
Nov. 5th...	199,200	13,600	17,200	26,100	14,100	17,000	14,900	32,400	25,100	19,000
" 12th...	167,000	13,300	16,700	26,400	12,400	14,800	11,100	23,700	18,200	12,800
" 19th...	166,400	13,500	16,900	28,600	12,700	15,400	10,100	22,600	16,600	9,100
" 26th...	169,900	13,100	16,300	29,500	12,800	15,700	10,200	23,400	17,600	8,700
Dec. 3rd...	178,000	12,800	16,300	28,900	13,100	16,300	11,300	27,100	20,200	8,900
" 10th...	189,100	12,300	16,800	28,900	13,500	16,900	12,400	31,800	23,400	9,600
" 17th...	166,500	11,500	14,400	25,500	12,200	14,700	11,300	26,700	20,000	10,400
" 24th...	309,900	24,800	30,700	47,100	25,700	27,400	20,300	45,300	34,900	9,900
" 31st...										14,700
										15,900
										22,900

TABLE D—(contd.)

Standard Regions

Week ended	England and Wales	Northern	East and West Ridings	North Western	North Midland	Midland	Eastern	London and South Eastern		Southern	South Western	Wales
								London and Midlands	Remainder			
1958												
Jan. 7th ...	271,100	18,700	27,000	38,700	22,000	24,600	18,200	44,100	31,300	13,900	14,900	17,700
" 14th ...	230,000	19,500	24,500	35,400	18,600	20,500	15,400	34,400	24,200	11,200	12,300	14,000
" 21st ...	200,300	17,000	21,900	32,500	17,100	18,600	12,900	27,600	19,900	9,300	10,900	12,600
" 28th ...	205,100	19,100	22,600	35,000	17,300	18,700	12,400	25,500	19,600	9,500	11,300	14,200
Feb. 4th ...	194,800	17,800	21,800	32,200	17,400	18,600	11,700	24,300	18,400	9,200	10,500	12,900
" 11th ...	187,200	17,000	21,100	32,300	16,200	17,700	11,100	23,100	17,600	8,600	9,800	12,600
" 18th ...	181,100	16,800	21,000	32,000	15,300	17,500	10,300	21,700	16,300	8,200	9,500	12,600
" 25th ...	159,300	14,300	17,800	28,200	12,600	15,900	9,100	19,700	14,600	7,100	8,500	11,400
Mar. 4th ...	172,200	15,600	21,100	31,300	14,500	16,800	9,800	20,700	15,200	7,200	8,300	11,600
" 11th ...	151,600	13,900	17,100	27,000	12,000	14,900	8,400	19,000	13,900	6,500	7,700	11,000
" 18th ...	159,200	15,400	17,500	28,100	12,200	15,600	8,800	19,800	14,400	6,900	8,600	12,000
" 25th ...	159,600	14,400	17,000	28,500	12,100	15,700	8,800	20,400	15,000	7,000	8,600	12,000
April 1st ...	161,200	13,900	17,200	29,500	12,100	16,000	8,800	21,100	15,000	7,300	8,600	11,700
" 8th ...	96,400	9,100	12,100	16,800	7,700	10,200	4,900	10,800	8,100	3,700	4,800	8,200
" 15th ...	152,200	13,700	15,700	27,200	11,100	14,500	8,600	19,800	14,300	6,900	8,300	12,100
" 22nd ...	142,900	12,800	15,300	24,600	10,700	14,400	8,000	18,500	13,500	6,400	7,900	10,800
" 29th ...	135,600	11,900	14,400	22,800	10,500	13,700	7,700	17,800	12,700	6,100	7,500	10,300
May 6th ...	123,500	11,300	13,900	20,400	9,700	12,400	6,900	15,800	11,400	5,600	6,800	9,400
" 13th ...	113,100	10,600	12,400	18,600	8,800	11,000	6,600	14,300	10,600	5,200	6,300	8,800
" 20th ...	104,100	10,100	11,400	17,400	8,200	10,000	6,000	13,400	9,400	4,700	5,700	7,900
" 27th†	85,000	8,500	10,100	14,700	6,900	7,800	4,600	9,900	7,200	3,700	4,400	7,100
June 3rd ...	105,700	10,200	11,700	17,000	8,200	9,800	6,100	13,000	9,500	5,000	6,000	8,200
" 10th ...	106,500	9,600	11,800	18,100	8,500	10,800	6,000	12,800	9,300	4,800	6,100	8,800
" 17th ...	99,700	9,000	11,800	16,500	7,900	10,000	5,500	12,100	8,900	4,600	5,400	8,100
" 24th ...	99,400	9,100	11,700	16,100	8,300	9,900	5,700	11,800	8,700	4,600	5,400	8,100

* The local offices of the Ministry of Pensions and National Insurance were closed on 23rd and 26th December. The figures are combined for the weeks ended 24th and 31st December, 1957.

† Bank Holidays.

APPENDIX

TABLE E

*Original notifications of pneumonia by week**England and Wales and Standard Regions—July, 1957 to June, 1958*

Week ended	England and Wales	Standard Regions								Wales
		Northern	East and West Ridings	North Western	North Midland	Midland	Eastern	London and South Eastern	Southern		South Western
1957										
July 6th	266	20	41	40	23	30	20	43	17	15
" 13th	197	9	52	21	14	25	9	36	5	15
" 20th	156	14	26	15	16	20	11	29	8	10
" 27th	172	13	22	25	15	29	7	26	5	20
August 3rd	167	10	21	18	15	17	10	30	9	17
" 10th	179	11	33	33	19	16	11	31	7	8
" 17th	223	14	48	24	20	25	10	50	10	11
" 24th	176	22	39	23	12	22	4	33	10	8
" 31st	184	13	39	26	15	29	4	35	6	8
September 7th	206	16	46	37	13	22	12	30	11	6
" 14th	333	22	87	80	25	18	10	52	6	14
" 21st	702	75	183	192	46	63	25	51	6	17
" 28th	1,367	120	389	326	108	103	27	125	25	37
October 5th	1,880	223	362	438	148	178	91	247	35	71
" 12th	2,275	279	313	406	189	300	136	329	78	135
" 19th	2,280	168	243	300	204	278	142	515	127	196
" 26th	1,897	132	154	154	157	235	115	581	111	178
November 2nd	1,443	35	98	106	69	135	181	477	86	156
" 9th	742	28	55	72	55	61	92	235	52	63
" 16th	623	32	67	73	25	54	52	197	34	54
" 23rd	499	39	75	61	33	53	41	107	23	39
" 30th	486	35	79	56	19	42	31	105	53	42
December 7th	649	59	90	72	55	49	51	159	40	50
" 14th	778	67	119	69	43	68	45	210	40	64
" 21st	703	67	86	67	29	69	48	203	25	52
" 28th	755	69	120	87	49	80	47	188	23	45

TABLE E—(contd.)

Week ended	England and Wales	Standard Regions									
		Northern	East and West Ridings	North Western	North Midland	Midland	Eastern	London and South Eastern	Southern	South Western	Wales
1958											
January 4th	1,341	100	166	115	104	130	103	377	66	61	119
" 11th	1,292	86	171	107	81	94	88	391	78	95	101
" 18th	1,059	118	137	61	92	85	80	305	59	72	50
" 25th	917	73	147	82	66	91	64	241	33	65	55
February 1st	909	78	138	78	92	88	74	203	36	75	47
" 8th	1,023	60	156	80	103	131	63	283	46	64	37
" 15th	882	63	133	86	75	87	70	191	56	65	56
" 22nd	793	37	88	80	81	131	75	166	32	60	43
March 1st	773	62	129	80	63	102	44	166	31	60	36
" 8th	690	47	108	84	53	65	79	134	46	35	39
" 15th	537	47	65	47	29	68	39	115	20	71	36
" 22nd	514	41	83	64	34	56	31	109	25	38	33
" 29th	621	30	80	103	41	59	44	133	36	59	36
April 5th	534	36	85	59	46	50	30	126	30	47	25
" 12th	585	39	79	60	51	62	45	145	25	41	38
" 19th	556	51	97	52	45	46	39	113	29	40	44
" 26th	507	62	66	41	47	49	27	115	26	42	32
May 3rd	425	51	66	39	22	57	24	92	10	40	24
" 10th	304	23	42	36	22	28	27	78	9	18	21
" 17th	243	25	37	34	15	22	18	42	11	21	18
" 24th	255	16	43	28	15	33	14	63	12	15	16
" 31st	238	22	32	29	16	22	21	49	13	19	15
June 7th	264	19	39	36	17	26	21	51	13	19	23
" 14th	247	21	37	27	15	25	13	61	10	20	18
" 21st	214	18	36	24	11	24	11	47	8	20	15
" 28th	218	16	39	23	13	22	21	52	7	13	12

APPENDIX

TABLE F

Deaths from all causes, influenza, pneumonia and bronchitis by week(a) *Great Towns—July, 1957 to March, 1958*(b) *England and Wales—July, 1957 to June, 1958*

(England and Wales figures for July to December, 1957 are calculated)

Week ended	All causes		Influenza		Pneumonia		Bronchitis	
	Great Towns	England and Wales	Great Towns	England and Wales	Great Towns	England and Wales	Great Towns	England and Wales
1957								
July 6th ...	4,920	8,777	5	10	221	367	145	260
" 13th ...	4,283	7,641	1	2	139	231	144	259
" 20th ...	4,330	7,760	—	1	140	232	120	215
" 27th ...	4,439	7,919	3	6	137	228	115	207
August 3rd ...	4,552	8,121	—	—	155	257	142	255
" 10th ...	4,365	7,787	2	4	144	235	127	225
" 17th ...	4,276	7,628	2	4	132	216	132	234
" 24th ...	4,365	7,787	6	12	138	226	115	203
" 31st ...	4,474	7,982	2	4	144	235	120	212
September 7th ...	4,689	8,365	8	16	177	244	128	212
" 14th ...	4,692	8,371	47	91	245	337	158	261
" 21st ...	5,211	9,296	121	235	273	376	188	311
" 28th ...	5,410	9,652	282	549	418	576	276	456
October 5th ...	6,070	10,713	442	727	493	669	347	549
" 12th ...	6,761	11,900	592	973	572	777	461	730
" 19th ...	6,544	11,518	607	998	552	750	502	795
" 26th ...	6,263	11,024	399	656	507	689	478	757
November 2nd ...	5,706	10,043	263	432	406	551	315	499
" 9th ...	5,661	9,964	149	284	306	451	333	517
" 16th ...	5,779	10,172	102	194	328	484	332	515
" 23rd ...	5,947	10,468	70	133	353	521	309	480
" 30th ...	6,248	10,997	84	161	338	499	464	721
December 7th ...	6,999	12,319	88	163	468	685	673	1,100
" 14th ...	7,448	13,110	99	183	566	828	840	1,373
" 21st ...	7,724	13,595	82	152	586	857	823	1,346
" 28th ...	7,221	12,710	89	165	629	920	736	1,203
1958								
January 4th ...	8,206	14,238	143	292	752	1,233	905	1,421
" 11th ...	8,129	14,375	155	315	678	1,177	871	1,398
" 18th ...	7,987	13,853	109	243	575	1,032	815	1,253
" 25th ...	7,702	13,402	107	217	581	992	798	1,239
February 1st ...	7,927	14,136	97	204	604	1,087	805	1,231
" 8th ...	7,003	12,630	75	184	493	891	678	1,085
" 15th ...	7,272	13,118	49	129	509	944	629	1,023
" 22nd ...	6,294	11,523	38	101	430	819	494	834
March 1st ...	6,287	11,366	49	112	389	740	497	832
" 8th ...	6,430	11,601	37	76	401	722	478	793
" 15th ...	6,295	11,462	38	79	386	693	449	747
" 22nd ...	6,558	12,019	28	69	382	706	452	807
" 29th ...	7,082	12,777	29	72	443	838	489	846

TABLE F—(contd.)

Week ended				All causes		Influenza		Pneumonia		Bronchitis	
				Great Towns	England and Wales	Great Towns	England and Wales	Great Towns	England and Wales	Great Towns	England and Wales
April	5th	...	...	—	11,452	—	47	—	764	—	698
"	12th	...	...	—	11,404	—	57	—	727	—	734
"	19th	...	...	—	11,611	—	45	—	702	—	703
"	26th	...	...	—	10,673	—	35	—	654	—	518
May	3rd	...	...	—	9,977	—	23	—	529	—	492
"	10th	...	...	—	9,041	—	19	—	435	—	362
"	17th	...	...	—	8,721	—	15	—	376	—	306
"	24th	...	...	—	9,208	—	14	—	364	—	313
"	31st	...	...	—	8,802	—	14	—	321	—	308
June	7th	...	...	—	8,837	—	7	—	348	—	302
"	14th	...	...	—	8,640	—	9	—	328	—	285
"	21st	...	...	—	8,558	—	8	—	342	—	299
"	28th	...	...	—	8,370	—	11	—	314	—	272

APPENDIX

TABLE G

Deaths from all causes, influenza, pneumonia and bronchitis by age, sex, and month of occurrence
England and Wales—July, 1957 to June, 1958

Age	July	August	September	October	November	December	January	February	March	April	May	June
ALL CAUSES												
All ages	M. 18,024 F. 16,844	18,095 16,908	20,222 18,761	25,946 23,480	23,480 21,511	30,691 27,964	32,001 29,427	24,853 23,679	27,201 25,842	23,523 23,208	20,223 19,371	17,465 16,916
0-4 weeks	M. 557 F. 377	574 407	542 420	576 431	540 410	617 414	668 453	568 400	627 430	572 409	579 446	520 357
4 weeks-1 year	M. 156 F. 135	175 147	182 141	201 167	220 183	317 256	345 282	303 285	299 217	251 186	186 131	134 116
1-	M. 103 F. 86	87 68	105 104	165 108	110 87	136 114	158 124	121 86	125 88	122 101	98 68	92 56
5-	M. 154 F. 87	156 72	178 151	200 168	98 71	115 83	125 99	95 74	122 89	141 92	143 71	110 61
15-	M. 305 F. 108	247 114	270 166	320 197	235 92	262 131	225 125	158 115	204 107	206 110	209 85	146 85
25-	M. 844 F. 660	913 661	957 831	1,153 915	925 721	1,194 806	1,096 857	912 678	942 691	892 700	916 685	733 584
45-	M. 5,257 F. 3,270	5,043 3,280	5,995 3,725	7,574 4,536	6,477 3,928	8,312 4,760	8,571 4,773	6,701 3,938	7,128 4,275	6,268 3,877	5,647 3,683	4,887 3,171
65-	M. 4,962 F. 4,166	5,053 4,196	5,723 4,804	7,728 6,157	6,722 5,472	8,844 6,910	9,251 7,295	6,868 5,597	7,492 6,258	6,614 5,644	5,534 4,734	4,854 4,207
75 and over	M. 5,686 F. 7,955	5,847 7,963	6,270 8,419	8,029 10,801	8,153 10,547	10,894 14,490	11,562 15,419	9,127 12,506	10,262 13,687	8,457 12,089	6,911 9,468	5,989 8,279

TABLE G—(contd.)

Age	July	August	September	October	November	December	January	February	March	April	May	June
INFLUENZA												
All ages	M. F.	12 1	9 18	564 531	1,937 1,591	446 381	359 430	534 529	247 240	153 144	80 69	23 22
0-4 weeks	M. F.	— —	— —	— —	2 2	1 —	2 —	1 —	— —	— —	— —	— —
4 weeks-1 year	M. F.	1 —	— —	9 5	15 15	3 4	5 2	4 9	4 3	1 —	2 1	— —
1-	M. F.	— —	— —	17 10	25 17	6 4	3 4	8 4	1 —	— —	2 —	— —
5-	M. F.	— —	— —	42 57	54 72	5 4	4 3	6 7	— 2	1 —	2 —	— —
15-	M. F.	— —	— —	40 46	70 81	5 5	7 12	5 2	4 4	4 1	3 4	— —
25-	M. F.	— —	— —	58 85	133 148	25 20	17 24	31 20	17 10	7 13	5 1	2 1
45-	M. F.	3 —	2 2	222 132	693 381	155 93	105 95	161 101	86 53	49 17	27 10	3 3
65-	M. F.	5 1	3 5	131 115	579 404	132 88	112 111	159 141	63 53	38 34	17 15	3 1
75 and over	M. F.	3 —	1 6	45 80	366 471	114 163	104 179	159 245	72 115	53 77	22 38	2 7

TABLE G—(contd.)

Age	July	August	September	October	November	December	January	February	March	April	May	June
PNEUMONIA												
All ages	488 499	518 441	900 819	1,619 1,375	1,076 972	1,869 1,956	2,047 1,974	1,410 1,457	1,429 1,421	1,127 1,249	671 677	560 515
0-4 weeks	—	—	—	—	—	—	—	—	—	—	—	—
4 weeks-1 year	32 28	40 29	45 42	60 42	70 46	126 91	126 115	116 109	111 89	75 64	43 42	28 31
1-	9 12	5 10	18 15	27 21	10 15	21 30	37 19	19 21	26 19	24 20	12 9	9 8
5-	3 5	2 3	18 23	22 15	7 6	8 7	6 7	2 5	9 13	5 6	3 6	3 2
15-	8 2	7 —	10 19	22 9	7 1	8 7	11 5	7 8	4 5	9 4	6 1	3 1
25-	15 7	5 11	39 48	60 50	28 16	49 45	36 45	33 25	28 15	23 22	15 10	19 13
45-	92 51	80 34	234 136	424 229	215 117	401 260	438 235	270 149	263 157	199 128	107 61	79 53
65-	109 88	132 87	216 181	461 360	292 226	539 417	532 445	347 297	338 284	293 268	175 137	136 93
75 and over	220 306	247 267	320 355	543 649	447 545	717 1,099	861 1,103	616 843	630 839	499 737	310 411	283 314

TABLE G—(contd.)

Age	July	August	September	October	November	December	January	February	March	April	May	June
BRONCHITIS												
All ages	733 250	702 262	1,041 406	2,091 885	1,746 671	3,684 1,673	3,952 1,876	2,550 1,284	2,389 1,122	1,857 837	1,032 459	883 321
0-4 weeks	— 1	— —	1 —	1 1	1 2	2 1	— 1	3 3	2 —	1 1	— 1	— —
4 weeks-1 year	5 7	10 5	6 5	8 8	12 6	23 16	31 25	22 24	27 16	16 12	13 7	3 3
1-	3 3	1 —	4 2	6 4	7 2	6 8	12 6	6 2	3 3	1 3	7 2	2 1
5-	— —	2 2	2 8	5 5	— 1	1 2	4 2	2 —	3 2	1 2	1 1	3 1
15-	1 —	1 3	— 3	2 4	2 —	3 2	4 —	3 5	1 1	2 1	3 —	— 1
25-	7 9	14 6	12 14	27 19	21 9	43 22	44 24	32 7	30 14	20 17	11 9	11 3
45-	205 37	185 38	366 80	693 140	573 100	1,210 287	1,309 329	788 190	718 180	539 112	279 62	250 59
65-	275 65	275 80	362 121	813 271	617 184	1,294 476	1,425 488	873 361	844 280	670 214	367 122	314 84
75 and over	237 128	214 128	288 173	536 433	513 367	1,102 859	1,123 1,001	821 692	761 626	607 475	351 255	300 169

TABLE H

Corrected notifications of pneumonia by sex and age by quarters
England and Wales—July, 1957 to June, 1958

		Males				Females			
		Sept. Qtr., 1957	Dec. Qtr., 1957	March Qtr., 1958	June Qtr., 1958	Sept. Qtr., 1957	Dec. Qtr., 1957	March Qtr., 1958	June Qtr., 1958
All ages	...	2,610	8,201	5,846	2,508	2,012	6,873	4,871	1,968
0—	...	271	697	1,106	278	211	551	913	242
5—	...	339	742	516	295	296	708	450	231
15—	...	734	1,936	1,071	606	641	1,921	879	435
45—	...	811	2,993	1,836	779	480	1,878	1,253	481
65 and over	...	437	1,738	1,245	521	361	1,744	1,331	550
Unknown	...	18	95	72	29	23	71	45	29